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APPLIANCES IN WATERBOUND MACADAM CONSTRUCTION

Gravel Loaded by Steam Shovel Directly from Bank Into Trucks—Steam Shovel Used for all Grading More Than Six Inches Deep—Screening and Loading Gravel with One Handling.

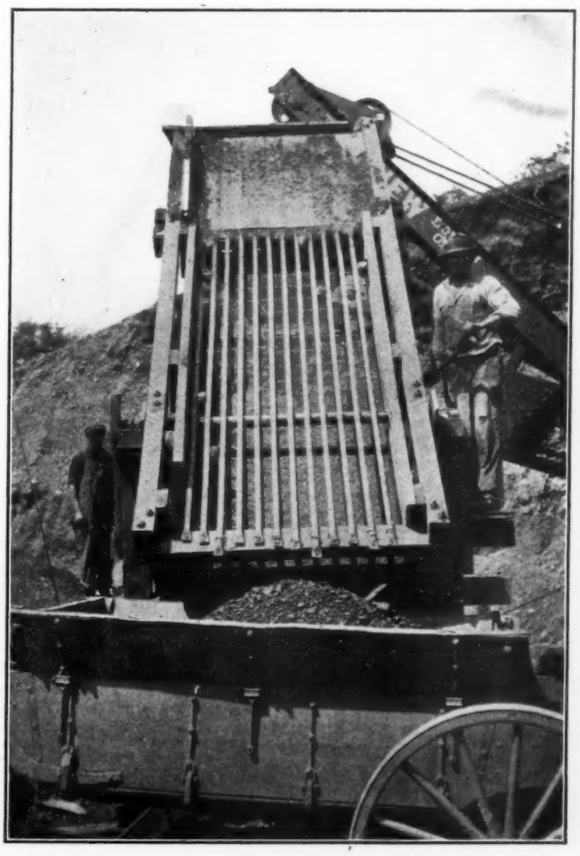
Because men are so hard to get, Fred E. Ellis of Melrose, Mass., who has the contract for constructing about 5½ miles of waterbound macadam between Castleton and Brookview, Albany Co., New York, is obliged to rely, to a large extent, on machinery and special devices to replace the men. Not more than 20 men have been on the job at any one time and the average number of laborers is usually about half of this, but the work is progressing favorably, except in grading, where the lack of men is most apparent. However, several miles have been partly graded and now the men employed are putting down the top course. With two rollers and all the men, 1,000 feet a day has been completed.

The job is principally resurfacing on an old gravel and earth road. The procedure is to lay gravel shoulders and banks to retain the stone when spread, deposit the stone on top of the old road and compact according to the department specifications for waterbound macadam. No scarifying, except a light treatment with the road grader, was given the old road.

Stone for the road was furnished by the New York Trap Rock Co., which took the contract to deliver the stone on the job. It was shipped by barge up the Hudson river to Castleton, where it was unloaded by clam shell buckets into a bin. From this bin it was loaded by gravity into motor trucks and hauled to the job. The Watson Contracting Co. did this part of the work and furnished a fleet of six 5-ton Pierce-Arrow motor trucks. These were loaded to capacity and hauled all the stone, the average haul being about 3 miles. The roads, being of dirt and gravel, were not adapted to such heavy traffic and were rapidly cut up. Nevertheless the trucks averaged 83 miles a day fully loaded, or about 210 ton-miles on stone hauling, in addition to hauling gravel on return trips. The trucks were equipped with a tail-board for spreading stone and were able to deliver the stone at about the required depth, though usually some redistributing by hand was necessary.

About 3 miles from Castleton was found a good gravel bed. This gravel was used as material for several fills along the road and as shoulders and side retainers for the macadamized section of the road. A Thew shovel, Type O, equipped with a ¾-yard dipper, handled all the gravel, loading it directly into the motor trucks. These carried, on their return trip from hauling stone, gravel for fills and for shoulders, dumping it along the road, to be redistributed by hand. This extra work delayed the trucks but little and saved a great deal of teaming.

At times the trucks were not available for hauling gravel, which was then done by teams and by a traction engine train composed of a Buffalo Pitts traction engine and a train of two or four Buffalo Pitts 6-yard bottom-dump trailers.

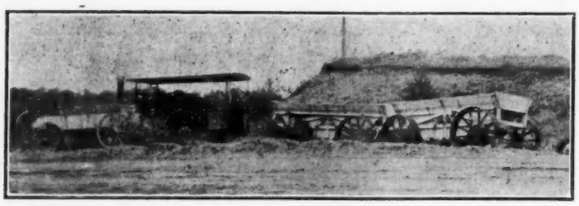


FRONT VIEW OF SCREEN TIPPED FOR DUMPING.

The Thew shovel, in addition to use at the gravel bank, was used on all cuts over 6 inches in depth. Mr. Ellis believes it is more economical on a cut of this sort to use the shovel even in case slightly too much is taken out and must be replaced by hand, than it is to do the excavating by hand.

On one section of the road a gravel sub-base was necessary. This required a rather coarser gravel and made it necessary to screen the gravel from the pit. In order to perform this screening and to obviate the necessity of handling the gravel twice, Mr. Ellis evolved a tipping screen that could be worked by the shovel with small loss of time and would require only one handling of material.

Unless he should purchase a new boom for his Thew shovel, the gravel could be raised and deposited not more than 10 feet. He therefore constructed a screen hinged



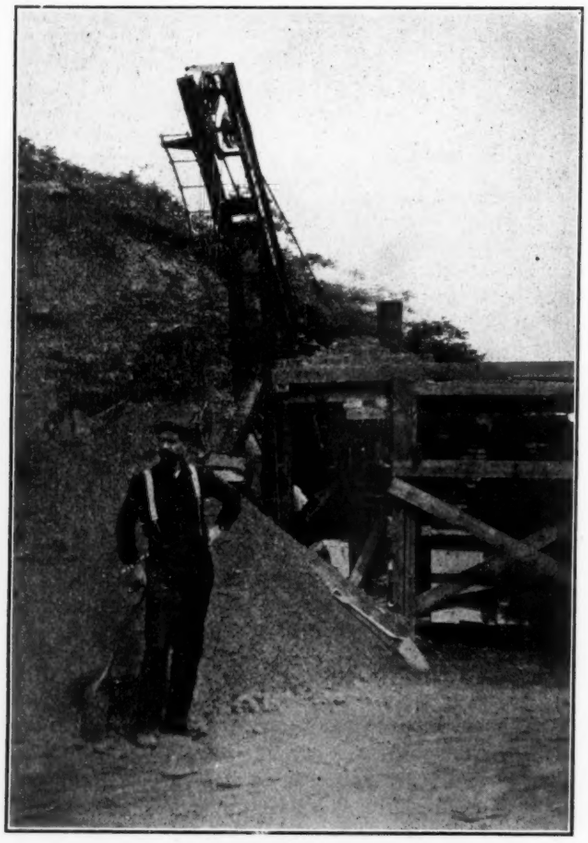
TRACTOR HAULING TWO SIX-YARD TRAILERS.

at one end, 10 feet high, on which the shovel deposited the gravel. The dipper was then lowered, caught onto the screen near the bottom and raised, allowing the coarser gravel to slide over the screen and into the truck, the fine material falling through the screen. This fine material was shoveled to one side by two men and placed within reach of the shovel. At intervals it was loaded into wagons and carted away for filling.

The screen was 10 feet long and 4 feet wide, built in two parts. An upper screen was composed of half-inch water pipe, 10 feet long, the pipes being about 3 inches apart. This was to break up the clods and prevent the larger stones from injuring the lower screen, placed a foot underneath. This lower screen was Clinton wire cloth with a mesh about ½ inch by 6 inches. At one end was built a board platform on which the shovel dumped. Under the other end stood the truck to be loaded.

The screen proper was supported at one end by a standard of 2 x 4's built under the platform, and at a point about 2 feet from the other end by a piece of shafting fastened to the screen frame, which was made of 2 x 6 timbers, with a U-bolt, and supported on a frame of 2 x 4's mounted on skids. The top of the pipe part of the screen was 10 feet above ground level.

At the bottom of the standard under the platform was fastened a short section of chain. The shovel dumped a dipperful on the platform, lowered the dipper to the chain, which was fastened to a tooth of the dipper, and raised the platform end of the screen about ten feet in the air. This revolved the screen about the shafting, bringing it to an angle of 45 degrees and allowing the gravel retained by the screen to slide into the truck. In this way the gravel could be screened with little delay and at a very low cost.



SIDE VIEW OF SCREEN; STEAM SHOVEL PLACING GRAVEL ON IT.

The method of laying the macadam is practically the same as that usually followed. Two Buffalo Pitts rollers are used on this work. Other equipment includes an Acme road grader, which is used in grading the road just before placing the stone. The shoulders are gone over by hand and the stone is usually placed by forks after being dumped by motor trucks. Cast iron pipes are used for culverts.

SIDE VIEW OF SCREEN LIFTED FOR DUMPING GRAVEL INTO WAGON.

SAFER GRADE CROSSINGS.*

Bad railway crossings cause many serious and fatal accidents. Constructing the road with a decided rise or fall just at the track contributes largely to the danger for automobiles at such crossings; but this construction is common where the railroad is above the normal level of the highway. To eliminate all grade crossings is out of the question; therefore, efforts to decrease loss of life must be directed largely toward making necessary grade crossings reasonably safe. A level stretch of road at each side of the track is necessary for safety.

Attempts are often made to get over bad crossings on "high." The steep ascent, combined with the necessity of slow speed over the rails to avoid jolting may cause the driver to "kill" his engine just as he reaches the rails. With the rear wheels perhaps still on the grade, there is no chance for momentum to carry the car over. A fast train bears down upon it—the crash is inevitable. Another accident is added to the long list.

The remedy is simple. A level stretch of road provided on each side of the track and an unobstructed view will result in saving many lives. Instead of the crest at the track there must be substituted a level section, even though steeper approaches are necessary. In most instances a satisfactory profile can be obtained at a moderate cost.

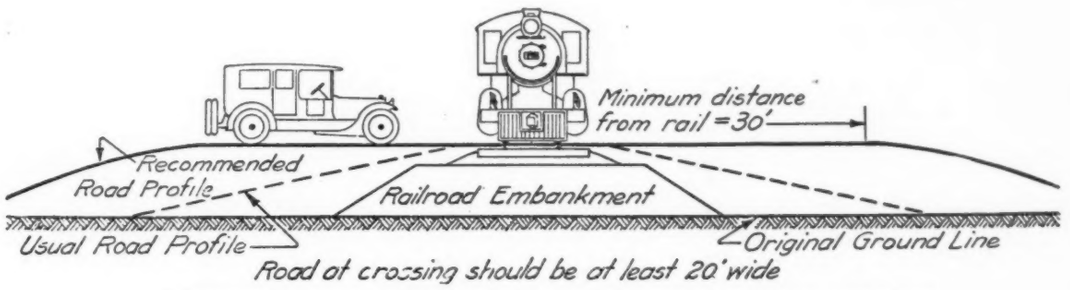
The level stretch should begin at least 30 feet in front of the first rail. Since a railroad right of way is usually

*An article in "Concrete Highway Magazine," by George S. Eaton.

100 feet wide, the improvement might well extend for this distance. Where the railroad fill is high enough to hide machines approaching from the opposite side, it is imperative that conditions be improved, for here there is additional danger of two automobiles colliding. Road engineers are recommending a minimum sight distance of 300 feet at every point along the road. Especially is this desirable at a grade crossing, and a level section here will aid in fulfilling this requirement.

Sufficient width should be provided for two automobiles to pass without slowing down for that purpose—20 feet at least. Then, if the crossing itself is made as even as possible, there will be no congestion at this most dangerous place.

The increased safety from such improvements is more than worth the cost, even though considerable. Crossings must be such that if an automobile is to stall it shall be somewhere other than in front of a train. Cooperation between county or township authorities and the railroads, working under the State Railroad Commissions, where they exist, will do much to make for safety. Continued neglect means more accidents.



RECOMMENDED AND USUAL ROAD PROFILES AT RAILROAD CROSSING.

TRAFFIC REGULATION AT RIGHT-HAND TURNS.

Editor, Municipal Journal, 243 West 39th St., City.

Dear Sir:

I am sending you herewith a scheme for the regulation of traffic at the intersection of streets or avenues where the vehicular as well as the pedestrian travel is heavy. I thought this might possibly be of interest to your readers.

The idea was evolved as particularly adapted to the intersection of congested thoroughfares such as 5th Avenue and 42nd Street, New York City. The scheme may be summarized as follows:

At the intersection of the curb line a barrier is placed extending a distance back from the intersection at each side sufficient to prohibit pedestrian traffic from crossing the street on the same line as the pavement. This is shown in the diagram by the heavy lines. This barrier may be either of ornamental iron work or of some material to make it ornamental in its effect. It should preferably extend a distance of, say 20 to 25 feet from the intersection of the curbs. The safety zone for pedestrians is placed on the lines from the ends of this barrier, as shown by the dotted lines across the street. The object of the barrier and the placing of the safety zone in a position as noted on the diagram may be described as follows:

Diagram No. 1 shows the line of traffic moving north and south as per the signal of the traffic officer, noted by the dot in the square near the tracks. The pedestrian traffic is then moving across the safety zone as shown. In case a vehicle moving north or south wishes to make the right hand turn, it does so and assumes a position alongside of the barrier and stops at the line of the safety zone for pedestrians. In this way the vehicle is out of the line of traffic going north or south and does not need to go through the flow of pedestrian traffic in order to get out of the way. The vehicle occupies a position as shown by the arrows, until the signal is given by the traffic officer for north and south traffic to stop and east and west to go. This allows the vehicle to proceed after the pedestrians have ceased to cross the zone. All vehicular traffic stops in front of a pedestrian safety zone as shown by the diagram.

On Diagram No. 2 is shown the possibility of a vehicle making a left-hand turn and assuming a position alongside of the barrier, without going through the flow of pedestrians crossing the street. This diagram also shows how a vehicle is caught near the intersection of the centers of the street when the signal to stop has been given by the traffic officer to vehicles moving in the direction in which it is going. It may stop alongside of the barrier and in front of the pedestrian safety zone without interfering with the flow of traffic across the street. This is shown by a dotted arrow assuming the position in the north barrier.

Incidentally the barrier also has the function of making people realize, by deflecting them out of their course, that they are making a dangerous crossing.

It is believed that such a scheme, installed at the intersection of avenues having pedestrian as well as vehicular traffic, will be a means of better regulation, quicker service and lessening of the possibility of accidents to pedestrians and vehicles.

Hoping that this will prove of interest, I remain

A PEARSON HOOVER.

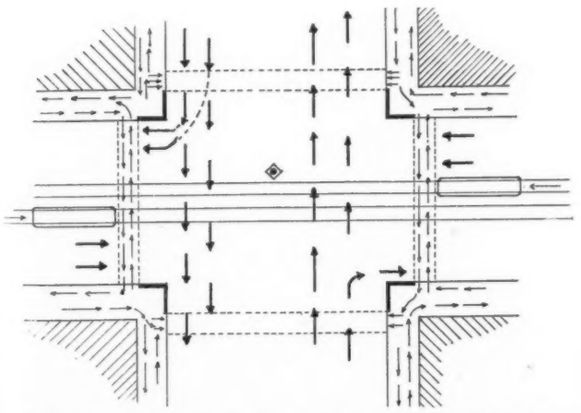


FIG. 1.—TRAFFIC MOVING NORTH AND SOUTH.

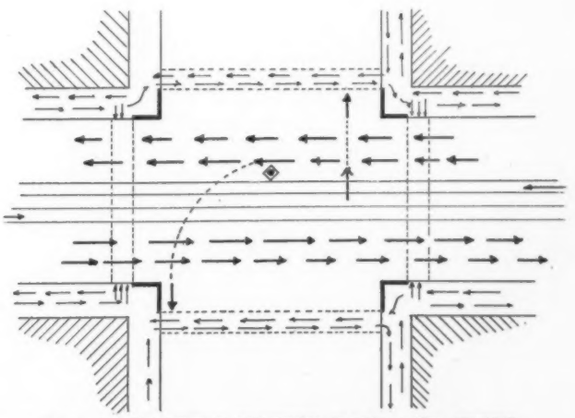


FIG. 2.—TRAFFIC MOVING EAST AND WEST.

BABY CARRIAGES AND STREET CROSSINGS.

By CHAS. M. BELL.

In the design of sidewalks and curbs at street intersections, engineers have seldom given much thought to facilities for getting baby-carriages and go-carts from the sidewalk to the pavement level, or vice versa. In some instances this is taken care of by bridging the gutter with an iron plate with a small rise in the pavement at this point. In other cases where the topography permits the catch-basin to be placed above the cross walk and no gutter is necessary, the cross walk and pavement can be made to come together in elevation at the curb. But in the majority of cases there is an abrupt drop of six inches or even more, necessitating a step up or down as the case may be.

The city in which the writer resides is even worse. The pavements have been in place for a number of years and evidently were not built for permanence. As a result, probably due to frost action, the curb stones have risen from one to two inches. This makes it necessary not merely to push the carriage off the curb but actually to lift it over the curb. A man or even a strong woman can do this easily, but on many women, not so healthy, who are compelled by circumstances to wheel their babies, it causes quite a strain. Many tired mothers have walked half a block in the middle of the street to take advantage of a driveway to return to the sidewalk.

If neither of the above mentioned remedies is practicable, there are other plans which are comparatively inexpensive and yet not undesirable. A break could be made in the curb the width of the sidewalk and the latter sloped from the gutter back and up to its proper elevation, making the slope several feet long if necessary. If this plan is not suitable, a special place could be made for baby-carriages. In many instances this could be situated on the curve of the curb between the intersecting walk unless prevented by the catch-basin. In other cases it could be made adjoining the walk and on the side away from the intersection. A break in the curb 30 inches long with a slope up from the gutter of about two to one, the whole constructed of concrete, would be ample.

It is certain that such an improvement would be greatly appreciated by the feminine population of the cities and in a great many cases by the other half as well.

The benefits derived need not be confined to baby-cabs. The device would also be used by the small boy with his wagon or velocipede, by the bicyclist and also by an occasional workman with his wheelbarrow.

SAN DIEGO PURCHASING BUREAU.

Early in the year 1916 the proposition of appending the Purchasing Bureau to the Operating Department was taken up by the council of San Diego, Cal., and the manager was asked to submit an estimate of the amount that could be saved by this further consolidation. His report estimated that a saving of $64,466.11 could be made by taking over the Purchasing Bureau the first of May, and it was agreed that this be done. Notwithstanding the fact that a delay of one month was experienced in making the change, this sum was saved, but in seven months instead of eight, as estimated.

During that time an up to date store room, in which is kept a stock of standard material, was built. By anticipating a rise in the market, a very considerable saving has been made in such staple articles as pipe, meters, hay, grain, etc., and a still further saving by buying in quantities. This bureau has a working capital of $20,000, and must, at the end of the year, show that much cash or its equivalent in stock, the stores being issued to the various departments on their requisition and at cost prices.

Fourteen automobiles were in use by the Operating Department of the city during the year, one Locomobile, one Kissel Kar, one Federal truck (in use five months), and eleven Ford cars. These cars covered a total mileage of 183,353, at an average cost of $.0523 per mile, averaging 14 miles per gallon of gas and distillate. The average cost per car for maintenance and operation, including all repairs, accessories and gas, was $47.80 per month.

HARTFORD WATERWORKS

History of Works—Details of Recent Improvements—Instrument Work at Reservoirs—Spillway Details—Grouting Seams in Foundation Rock.

Papers were presented at the Thursday morning session, September 13, of the convention of the New England Water Works Association by members of the engineering staff of the Hartford water works system, describing the past and present systems and features in the design and construction of various parts of the new supply.

The paper describing the past and present supplies was presented by W. E. Johnson, division engineer. Hartford, prior to 1855, secured most of its water from wells, but about this time constructed a small reservoir within the city limits and pumped water to it from the Connecticut river. Ten years later a gravity supply was obtained from a low range of mountains 6 miles west of the city, and this supply, secured by damming a small stream, with some water from the river, was adequate until 1873. At this time and afterwards, as was needed, additions to the mountain supply were made in quantities sufficient to stave off any immediate shortages.

By conserving the water and developing the West Hartford watershed, the amount of water was sufficient, though in 1899 raw water had to be pumped from the Connecticut river. Following this year of water scarcity, a general campaign of waste prevention was entered upon, so that there was no recurrence of the troubles of 1899.

In 1903 plans were considered for improving and enlarging the water supply, and several engineers were called in for consultation. The watershed of the West Hartford supply afforded little opportunity for increasing the amount of water, and several schemes for developing other sources were brought forward. In 1911 the Nepaug scheme was adopted by the board.

Following this, Frank Brainard described the distribution system. Some years ago a considerable amount of cement-lined pipe from 6 to 8 inches in diameter was used, but this did not prove entirely satisfactory, and in 1885 it was decided to replace all such pipe with cast iron, and only a small amount of the cement-lined pipe is now left. In 1899 it was decided to meter services, and work upon this has been continued. Among other meters, 12 detectometers have been installed. By metering, the consumption has been reduced from 85 gallons to 65 gallons per capita per day.

A number of factories have their own fire supply, drawing polluted water from adjoining streams, and are also connected with the city service. The department realizes the possibility of pollution of the city supply and has placed double check valves on the services to all such factories. Each of these check valves is inspected every month and once a year is taken apart and examined and cleaned and returned to place.

The distribution system in the business section of the

city has been so designed as to permit the supply of 10,000 gallons a minute to any block.

The meters are inspected regularly and then, as well as before first installation, must register not less than 98 per cent. of the entire amount passed and not more than 100 per cent. before they are used. In response to a question, Mr. Brainard stated that there is a master meter which meters all of the supply coming from the reservoir to the city and that 85 per cent. of the water passing through this meter is accounted for.

H. W. Horne then described the engineering work in connection with the new supply, especially that at the reservoirs. He went into the details of the new methods of laying out center lines for the dams and embankments and giving points on the slopes from time to time as the dams were raised. The masonry dam was built with its center line forming the arc of a circle, while its downstream face also was curved, and this combination of horizontal and vertical curves made the giving of points for construction quite complicated. A tower was erected at the center of the circular arc forming the center line of the dam, on which tower an instrument was placed from which were given the lines of the radial joints in the concrete. Two other points, one at each end of the dam, were solidly set, and these three points established a triangle to which all measurements of the dam were referred.

Features in the designing of the spillway of the Richard's Corner dam were described by R. E. Wise. The greatest care was taken in determining the amount of run-off for which this spillway should be designed, since the dam was of earth and any overtopping of it would be fatal. Previous records of run-off in the stream being dammed and also in other streams in the eastern part of the United States were carefully studied, and it was finally decided to design a spillway calculated to pass 165 gallons per minute for each square mile of the watershed. The spillway is built at right angles to the line of the dam and at one end of the dam, being of masonry founded upon bedrock and discharging into a channel in such rock, which channel is carried down the side of the hill to a point below the dam and discharges into the stream bed several hundred feet below the embankment.

Following this, the methods employed in constructing of cyclopean masonry the Nepaug dam was described by Mr. Griswold. The rock on which this dam was placed was pitched at such an angle as to give a smooth slope to a large part of the bottom of the foundation trench, but a rough, jagged surface to the remainder of it. Care was taken to remove all rock down to solid bedrock and to have this thoroughly clean before the concrete was applied.

Before placing concrete in this dam or in the core wall of the earthen dam the foundation rock was thoroughly tested for leakage, and any seams discovered were filled with cement grout under pressure. (A brief description of this was given in Municipal Journal for March 9, 1916.) This work was described by J. E. Garrett. In grouting these foundations, holes were drilled vertically into the rock for a depth of 30 to 40 feet, and a pipe was then fastened with cement into the top of each hole. At first 1½-inch pipes were used, but these were found too small, and 2-inch pipes were substituted in the later work. Thin grout of cement and water was then pumped into the hole at a pressure of 80 to 100 pounds. If large seams took this grout too readily, it was thickened until it apparently began to stop the leakage, in some cases sand being added to assist in such stoppage. Following this the grout was thinned and cement only used, so that it should penetrate the minutest cracks and seams. Where the grout tended to escape through seams at the surface, the entire surface of the rock in the vicinity was covered with a layer of concrete, and this was allowed to set before pumping of grout was continued. After a row of such holes extending parallel to the axis of the dam had been grouted until they would take no more, another row of secondary holes was drilled parallel to the first, and these grouted under pressure in the same way. Ordinarily the secondary holes took very much less grout than the first line, since these latter filled all seams and crevices for a considerable distance.

USE OF METERS IN BOSTON METROPOLITAN DISTRICT

Abstract of Paper Before New England Waterworks Association—Consumption Reduced 32 Per Cent. in Nine Years.

Samuel E. Killam, superintendent of pipe lines and reservoirs of the Metropolitan Water Works, Boston, gave a history of the adoption of meters in that district, together with figures showing the results thereof. Boston first introduced meters in 1852 for the purpose of checking waste, the consumption of 55 gallons per capita being double what had been counted on. These were known as the Huse meter and were not very reliable. In 1861 there were 109 service meters in use, mostly on the services of the leading hotels. In 1871 there were 1,091 meters in service, but during the next nineteen years only 6 meters were installed. In 1879 the consumption in the high-service district, almost entirely domestic, was at the rate of 110 gallons per capita during the day hours and at the rate of 72 gallons during the night hours (11 P. M. to 4 A. M.). In July, 1883, Dexter Brackett inaugurated a systematic inspection by operating Deacon waste detector meters and making house to house inspection, which resulted during the first four months in issuing 6,000 notices to stop waste of water from house fixtures. By this means consumption in some districts was reduced 35 per cent. This system was followed for ten years, but with decreasing diligence, and the checking of waste was not permanent, but the rate continued to increase, and in the early '90s it was apparent that the city had nearly reached the limit of its resources.

In 1895 the Metropolitan Water Board was created by the state and given power to furnish water to all municipalities within ten miles of the State House. The successor to this board, the Metropolitan Water and Sewerage Board, now furnishes water to 20 cities and towns, only one city, Newton, within the district being supplied from an independent source. Five pumping plants are now operated in place of twenty. In 1916 about 72 per cent of the entire supply was delivered by gravity directly to the distribution system, the remainder being pumped and 1.4 per cent being raised a second time.

In 1902 the board was authorized to provide facilities for measuring the water supplied to the several cities. The Venturi meter was adopted as the best and most suitable device to measure the large quantities required without too great loss of head. There are now 69 of these, varying in size from 6 inches to 60 inches. Of these, 54 are provided with registers type D, five with type M and one with type V. In districts where the quantity to be measured is small, Hersey Detector meters, model F. M., are used. The total cost to January 1, 1917, of installing these meters, including the registers and appurtenances, was $94,364. The total cost for charts and repairs to meter registers since their installation in 1903 has averaged about $3.50 per meter register per year, of which $3.25 was for charts.

In 1904 it was ordered that the water assessment on each municipality supplied by the board be based on the

valuation and consumption after the year 1905, on the ratio of one-third valuation and two-thirds consumption. In 1907 it was ordered that after January 1, 1908, all cities and towns that derived their supply from the Metropolitan Water Works should equip all new service pipes with water meters and should also equip annually with meters 5 per cent of the services that were unmetered on December 31, 1907, and should thereafter charge each consumer in proportion to the amount of water used. (Several of the municipalities have installed meters on considerably more than 5 per cent of the old services per year and eight are 100 per cent metered.) In the nine years since this progressive metering began the average consumption of the district has been reduced from 130 gallons to 89 gallons per capita per day, or nearly 32 per cent.

Night Consumption and Percentage of Services Metered in Each City and Town of the Metropolitan District.

City or Town.	Per cent. of Services Metered. Jan. 1, 1907	Jan 1, 1916	Consumption per capita, 1 a. m. to 4 a. m. 1907	1916
Arlington	33.6	100.0	50	28
Belmont	100.0	100.0	31	18
Boston	5.5	53.2	107	62
Chelsea	14.6	99.7	59	35
Everett	2.0	50.0	50	42
Lexington	2.1	92.0	43	37
Malden	93.6	95.5	22	28
Medford	10.5	100.0	65	22
Melrose	3.9	100.0	85	26
Milton	.100.0	100.0	16	10
Nahant	17.2	64.1	50	51
Quincy	14.2	88.6	66	39
Revere	4.8	70.8	54	34
Somerville	24.6	69.2	55	34
Stoneham	1.9	98.5	55	29
Swampscott	37.8	100.0	41	28
Watertown	98.3	100.0	36	29
Winthrop	2.3	100.0	65	26
District	14.7	66.8	88	51

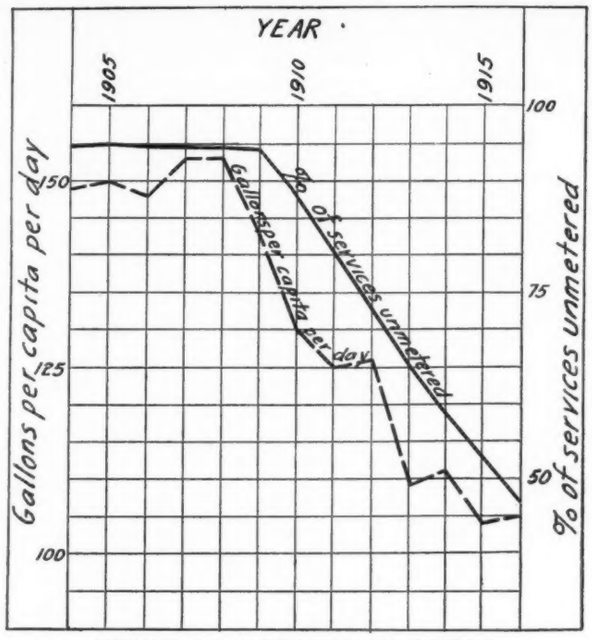
The city of Boston has been divided into seven districts by master meters, and the average per capita consumption of each at three-year intervals is given in the accompanying table. The southern low-service district

Per Capita Consumption in Boston at Three-Year Intervals, by Districts.

District by Services.	1907	1910	1913	1916
Southern Low	148	128	126	115
Southern High	162	128	100	105
Charlestown	200	188	114	113
East Boston	130	110	58	61
Brighton	132	107	77	89
West Roxbury	130	132	92	57
Breeds Island	63	53	35	31
Total	153	130	109	105
Per cent of services metered	5.6	12.5	34.8	53.2

comprises the lower area of the city proper, in which is located the greater part of the business and manufacturing plants, railroad terminals and electric light and power plants All the other districts are residential, although the southern high-service district includes several of the largest hotels and some business and manufacturing plants. In East Boston and Charlestown considerable quantities of water are used by railroads and shipping and some by manufacturing plants. The effect of the use of service meters upon consumption of water is very graphically illustrated by the accompanying diagram showing the daily number of gallons used per capita in the city of Boston and the percentage of unmetered taps for each year from 1904 to 1916, inclusive.

In Melrose, which is largely residential, the reduction due to the installation of service meters has been especially noticeable, as shown by the table.



EFFECT OF METERING IN BOSTON.

Consumption Per Capita in Melrose, Mass.

	1907	1909	1916
January	113	60	43
February	125	61	43
March	116	58	44
April	109	60	43
May	111	63	46
June	120	71	46
July	122	71	45
August	131	66	49
September	116	63	49
October	115	61	47
November	113	60	45
December	115	55	44
Year	117	62	45
Per cent of services metered	3.9	100	100

In spite of the considerable reduction effected, the consumption between 1 and 4 A. M. averags a rate of 51 gallons per capita for the entire district, which Mr. Killam believes to be strong proof that a large amount of preventable waste is still taking place. However, if the population of 1916 had used water at the rate existing in 1907, the consumption by the district in 1916 would have been 48,799,000 gallons more per day than it was. This reduction of consumption has postponed for years the necessity of constructing new works to increase the supply at an estimated cost of $32,000,000, besides reducing the cost of maintaining the existing works.

MOTOR TRUCK OPERATION RECORDS IN CHICAGO.

At the beginning of 1916, the former Pipe Yard was made a division of the Water Department of Chicago. To this division was transferred the storage and handling of all of the stock materials used in the Department of Public Works. It is necessary to have ample facilities for prompt distribution of materials to all parts of the city and a fleet of motor trucks were secured for the work. The operation of this fleet has permitted a reduction in the number of hired teams and a proportionate reduction in the cost of hauling. Complete costs of operation for the fleet are shown in the table.

The Pierce-Arrow trucks, 1, 2, 3 and 4, are used for general delivery from warehouse and pipe yards. The Kelly-Springfield 1-ton trucks, 5, 6 and 7, are run on 24-

hour service with two or three drivers, being used on water pipe extension work. No. 10 is used for delivering Police Department supplies and Nos. 11 and 17 on meter division work. No. 8 is on general delivery work and the others chiefly on extension, construction and testing work. No. 14 is a car equipped with a centrifugal pump and is used to test mains.

RAPID SAND FILTRATION

History of Its Development—Negative Head—Essentials of Filter Washing — Rate Control — Red Water Troubles—Hoover Aluminum Sulphate.

An exhaustive paper on this subject was presented before the New England Water Works Association September 12th, by George A. Johnson, of which only a brief abstract can be presented. The first municipal rapid sand filter was built at Somerville, N. J., in 1885. Five years later 310,000 population of this country was supplied with water filtered by both slow and rapid sand filters, which number in the 27 years since then has been increased to 18,293,000. The percentage of population of the country receiving filtered water increased more than 25 times, and in the meantime the typhoid death rate decreased 75 per cent. In January, 1917, rapid sand filtration was in use in 682 municipalities of the United States and 39 of Canada, serving a population of 13,411,000 in U. S. and 1,000,000 in Canada. Since 1910 the population served by rapid sand filters has increased 94 per cent. and the combined capacity of such filters has increased 139 per cent. This increase was principally due to the construction of large filter plants, such as those at Akron, Baltimore, Dallas, Erie, Grand Rapids, Minneapolis, St. Louis and Trenton, these eight plants alone providing a filtering capacity of 462,000,000 gallons and serving a population of 2,400,000.

The first comprehensive tests of the rapid sand process were conducted at Providence, R. I., in 1893-4, and more exhaustive ones in Louisville, Ky., in 1895-7. Within the next seven years investigations were carried on at Pittsburgh, Cincinnati, Washington, New Orleans and Harrisburg. These served more than anything else to establish on a sound footing the entire reliability of rapid sand filtration and were followed by a decade of extreme activity in filter construction.

Students of water purification have concluded that where water is markedly colored or possesses a turbidity of more than 30 parts per million, or where there are sharp fluctuations in the character of water ordinarily but slightly colored, rapid sand filters are best adapted to its purification, as compared with slow sand. The majority of American rivers come under one of these classes, especially that of high turbidity, which explains the reason for the more rapid growth of rapid sand than of slow sand filters.

The use of a coagulating chemical has always been a standard procedure in rapid sand filtration and it was this idea that was originally patented by John W. Hyatt in 1883. Usually sulphate of aluminum or iron is used. These coagulants remove much of the suspended and some of the dissolved impurities and thus relieve the filter of much of its burden. Delay of coagulation of the water until after it reaches the filters is to be guarded against, for which reason sufficient time must be allowed between the adding of the coagulant and the application to the filter. On the other hand, it should not be so long as to allow the removal by sedimentation of too much of the coagulated floc, some of which must collect in the filter itself to enable it to operate thoroughly. There are, however, some rapid sand pressure filters operating efficiently on relatively clear waters with no coagulating and settling basins ahead of the filters.

Before 1900 it was the practically uniform custom to build rapid sand filters of wood or steel tanks circular in form, each unit having a capacity of about two-thirds of a million gallons per day. The plant at Little Falls, N. J., constructed in 1902 marked the beginning of the present practice of building rectangular concrete tanks in larger units, the largest units being those at Cincinnati, which have a capacity of about 4,000,000 gallons each.

Rapid sand filters may be operated efficiently with either positive or negative head; in fact, the outlet piping on most rapid sand filters is so arranged as to allow of the utilization of negative head. (By negative head is meant

OPERATION OF BUREAU OF ENGINEERING MOTOR-TRUCKS, CHICAGO.

No.	MAKE	Capacity	Bought	Cost	Depreciation to Jan., 1917	Present Value	*Cost of Operation and Repairs for 1916	Miles Run in 1916	Ton Miles	Cost per Mile	Cost per Ton Mile
1	Pierce-Arrow.....	5 Ton	Mar., 1914	$4,960.00	$1,439.33	$3,520.67	$3,846.07	10,523.6	24,351.76	$0.38	$0.16
2	Pierce-Arrow.....	2 Ton	Mar., 1914	3,245.00	1,083.31	2,161.69	2,877.88	11,585.7	9,519.51	.25	.30
3	Pierce-Arrow.....	2 Ton	Mar., 1914	3,245.00	1,026.12	2,218.88	3,169.21	9,633.4	9,024.76	.33	.35
4	Pierce-Arrow.....	2 Ton	Mar., 1914	3,245.00	1,041.16	2,203.84	2,977.85	10,998.7	10,169.58	.27	.29
5	Kelly-Springfield.....	1 Ton	Mar., 1914	2,300.00	605.41	1,694.59	4,367.32	7,644.4	.....	.57	.....
6	Kelly-Springfield.....	1 Ton	Mar., 1914	2,300.00	386.83	1,913.17	2,437.21	3,979.9	.....	.61	.....
7	Kelly-Springfield.....	1 Ton	Mar., 1914	2,300.00	751.36	1,548.64	3,602.30	14,773.9	.....	.24	.....
8	Ford.....	800 Lbs.	June, 1914	570.00	213.83	356.17	990.00	7,533.1	.....	.13	.....
9	Ford.....	800 Lbs.	June, 1914	570.00	268.88	301.12	1,068.33	9,999.1	.....	.11	.....
10	Ford.....	800 Lbs.	April, 1915	496.25	139.15	357.10	1,475.73	9,764.8	.....	.15	.....
11	Ford.....	800 Lbs.	April, 1915	496.25	113.94	382.31	1,395.64	7,048.6	.....	.20	.....
12	Ford.....	800 Lbs.	April, 1915	416.25	186.81	229.44	1,158.83	10,482.6	.....	.11	.....
13	Ford.....	800 Lbs.	April, 1915	416.25	148.51	267.74	1,286.64	9,035.9	.....	.14	.....
14	White.....	1 Ton	Nov., 1915	3,193.82	279.80	2,914.02	1,822.15	7,463.2	.....	.24	.....
15	Ford.....	1 Ton	Sept., 1915	498.00	128.37	369.63	1,717.75	8,721.9	.....	.20	.....
16	General Motors.....	1½ Ton	April, 1916	2,205.00	134.99	2,070.01	1,558.02	6,136.2	.....	.25	.....
17	General Motors.....	1½ Ton	April, 1916	2,205.00	125.23	2,079.77	1,201.22	5,692.4	.....	.21	.....
18	General Motors.....	1½ Ton	April, 1916	2,205.00	129.63	2,075.37	1,505.43	5,892.3	.....	.25	.....
19	Ford.....	800 Lbs.	Aug., 1916	563.08	34.96	528.12	629.45	3,495.6	.....	.18	.....
20	Ford.....	800 Lbs.	Aug., 1916	563.08	35.84	527.24	598.43	3,584.2	.....	.17	.....
21	Ford.....	800 Lbs.	Aug., 1916	563.08	25.75	537.33	540.11	2,574.6	.....	.21	.....
22	Ford.....	800 Lbs.	Aug., 1916	563.08	37.26	525.82	602.97	3,725.6	.....	.16	.....
23	Ford.....	800 Lbs.	Aug., 1916	563.08	29.49	533.59	545.60	2,948.6	.....	.18	.....
24	Ford.....	800 Lbs.	Aug., 1916	563.08	24.22	538.86	507.61	2,421.6	.....	.21	.....
25	Ford.....	800 Lbs.	Aug., 1916	501.76	38.43	463.33	558.37	3,843.0	.....	.14	.....
26	Ford.....	800 Lbs.	Aug., 1916	501.76	51.63	450.13	†296.69	5,163.0	.....	.06	.....
27	Ford.....	800 Lbs.	Aug., 1916	501.76	35.27	466.49	545.22	3,526.6	.....	.16	.....
28	Ford.....	800 Lbs.	Aug., 1916	501.76	36.60	465.16	582.24	3,660.3	.....	.16	.....
29	General Motors.....	1½ Ton	Sept., 1916	2,205.00	65.57	2,139.43	524.43	2,980.5	.....	.18	.....
30	General Motors.....	1½ Ton	Sept., 1916	2,205.00	36.28	2,168.72	447.87	1,640.0	.....	.27	.....
	Total.....	.....	.....	$44,662.34	$8,653.96	$36,008.38	$44,836.57	196,473.3	53,005.61		

* "Cost of Operation and Repairs" includes supplies, repairs, interest, depreciation, garage overhead, and drivers' salaries, except as noted. † No driver's salary included.

any head in excess of that corresponding to the depth of the column of water standing over the filter surface.) In such cases a partial vacuum is formed beneath the clogged surface layer and produces what is in effect a suction action on the sand layer itself. Mr. Johnson discussed at some length the effect of negative head, the compacting of sand due to high velocity, the drawing of the suspended matter down into the bed, even after it had collected on the surface, and other details of the action of the rapid sand filter. Following this he described the successive methods of washing rapid sand filters, condensing this considerably as it was to be discussed later by Mr. Weston, as described in last week's issue. After making a comparison of methods, he stated that there are certain essentials of cleaning which do not allow of argument, these being that the gravel layer must not be unseated and so mix with the sand; the filter bed proper must be floated and so made amenable to thorough and economical washing; the upward flow of wash water must not be so great as to carry away with it appreciable quantities of the filter sand; the washing action must be such that masses of clogged sand will be broken apart so that the foreign matters will be separated from the sand; and, finally, but by no means least, the foreign matters thus separated from the sand must be carried upwards and out of the filter tank with the wash water.

One of the cardinal necessities in filter operation is the control of the rate of passage of water through the filter. Sudden fluctuations of more than 5 per cent have a marked disturbing influence on the condition of the filter bed and quality of the filtered water. Gradual variations in the rate of filtration, if relatively small, are of practically no significance, except perhaps where a material reduction in the velocity of flow of water will sometimes allow occluded air to pass upwards and break through the surface, the most effective part of the filter bed. The natural clogging of a filter takes place gradually, and where the rate is practically constant the frictional resistance to the flow of water builds up proportionately. Sudden increase in the velocity of flow through the filter will break the delicate clogged strata in the filter and carry the foreign matters causing them deep into the filter and even completely through it. The normal functions of the filter are thereby temporarily upset and the quality of the effluent is deteriorated.

The first effective automatic filter controller was that designed by E. B. Weston in 1899, and used in a very large number of plants. In this device the velocity head, or an artificially created difference in head in the effluent pipe, regulates the area of a discharge orifice. There are several automatic rate controllers of the Venturi type which are widely used, a Venturi tube being placed in the effluent pipe and beyond this a valve opening is regulated by the position of a piston contained in a cylinder, the pressure on the upper side of the piston being transmitted from the throat of the Venturi and that on the under side of the piston from the pipe beyond the Venturi.

Discussing the connection of rapid filtration with red water troubles, Mr. Johnson stated that if more alum is added than can be decomposed by the natural alkaline constituents of the water or by alkalies artificially added, the free alum renders the water acid and it will then undoubtedly corrode service pipes. But if the coagulating chemical is used as it should and always can be, no free alum reaches the effluent. It is possible, however, that small amounts of free carbonic acid will be liberated from the coagulating chemical when decomposed, which acid encourages corrosion; but this can easily be nullified by aeration of the filtered water. Special difficulty in this respect is found in treating soft surface waters that are relatively high in color and contain peaty organic matter. These waters are usually high in free carbonic acid, and when they are treated with aluminum sulphate to remove the color, this natural free carbonic acid is increased by some 4 parts per million to each grain per gallon of added coagulent. An efficient remedy is the aeration of the filtered water, whereby the bulk of the carbonic acid is dispelled. If the case is serious, the addition of alkalies will entirely eliminate the free carbonic acid, but this remedy is much less satisfactory than aeration.

The manufacture of aluminum sulplate at the filtration plant, as developed by Chas. P. Hoover at Columbus, Ohio, was described by Mr. Johnson. A plant capable of turning out a ton of alum per day occupies a space about 15 by 25 ft. and 10 ft. high, in addition to which storage space is required for the bauxite and sulphuric acid used in the manufacture. The only labor required is that of proportioning the raw materials, supervising their mixing by a small motor, discharging the mixture into crystallizing boxes and later removing the hardened cakes. Alum produced by the Hoover process is basic aluminum sulphate, which is even more effective per unit of weight than the ordinary commercial aluminum sulphate purchased in the open market. It contains from 7 per cent to 10 per cent of finely divided insoluble suspended matter which, by virtue of its very fine subdivision, serves as a nucleus around which the floc can form. Prices now are fluctuating, but roughly speaking 60° Beaume sulphuric acid can be bought for $20 a ton f. o. b. point of manufacture, and pulverized bauxite at $15 per ton at Bauxite, Ark. This gives the cost for raw materials to make a ton of 17 per cent aluminum sulphate about $19 plus freight, which would bring the total to about $25 in New England; to which labor, repairs and other incidental charges would add about $2. The Hoover process is now used in Springfield, Mass., Trenton, N. J., Cumberland, Md., Columbus, O., Omaha, Neb., and Montreal, Quebec; while a plant for making 1,500 tons a year is now being built at Little Falls, N. J.

Pressure filters are now operating on municipal supplies in 140 places with a total population of a little under 2,000,000. The individual plants range in size from 100,000 gallons per day up to the 21,000,000-gallon plant at Atlanta, Ga. They are filtering about 1.8 per cent of the amount of water being treated by rapid sand filters. The first rapid sand filters for municipal supplies were of the pressure type, but for some reason improvements in the pressure filter have not been made as rapidly or completely as with the gravity type. The model pressure filter of today, however, can be fitted with rate controllers and devices for accurately proportioning the dose of coagulant. In fact, everything that can advantageously be built into a gravity filter system is equally applicable to pressure filters. The pressure filter is particularly adapted to water problems where double pumping is an important item of expense, since with this type one pumping may be avoided. Where other conditions favor pressure filters, any deficiency of these in removing bacteria is relatively immaterial, since by modern sterilization, any bacteria remaining in the effluent can be positively disposed of.

CLEANING SEWERS IN CHICAGO.

In the seven sewer districts of Chicago during 1916, 7,416,900 feet of sewers were flushed at a cost of $42,496.72, or 57 cents per 100 feet; and 699,800 feet of sewers were scraped, this costing $57,329.70, or $8.19 per 100 feet. The cost of cleaning catch basins was rather low, being $2.97 each. At a cost totaling $146,459.26, 49,308 catch basins were cleaned. In all $306,399 were spent on work of this sort.

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DECREASING PLANT DEPRECIATION CHARGES.

"A penny saved is a penny earned," and a piece of equipment kept in good condition for future use is practically as good as a new one, and the cost of maintenance is much less than the purchase price. One of the contractors whose labor-saving appliance we have described recently said that this appliance had already saved its entire cost, but he said nothing about throwing it on the scrap heap on that account.

Too many contractors and municipal departments, however, are hastening the approach of scrapping time by neglect of their apparatus and other working capital. Engines, mixers and other appliances left standing all winter exposed to the weather deteriorate more during those three to five months than they do during the remaining months of the year of active use. Such neglect, therefore, divides their useful life by two or more and multiplies the annual depreciation charge against the work by the same figure. This applies to wagons, sheds and other buildings, and other wooden as well as metal structures.

All machinery should be housed or at least well protected from the weather by canvas covers; but even this will not wholly prevent rusting. It is well worth while to carefully go over each machine at the end of the working season, thoroughly covering all wearing parts and other bright metal with heavy grease, and painting all other surfaces. Wooden surfaces should be kept painted at all times, receiving a coat every year, and the best time is in the fall when work stops for the winter, for this is a defense against weathering during the winter, can be done after the busy season is over, when labor is plentiful and the appliances are not in use, and the painting will not need to be rushed through in the spring when everything may be on the jump to take advantage of favorable weather or an early contract.

A few gallons of paint applied each fall is a low price to pay for doubling the life of a valuable plant.

ROOF CONSTRUCTION FOR RESERVOIRS AND FILTERS.

For perhaps twenty-five years the construction of concrete roofs for filters and covered reservoirs has been practically standardized and the groined arch has been used almost exclusively. It is therefore the more remarkable a coincidence that two widely separated reservoirs described in the same issue of Municipal Journal should both have adopted the beam and flat slab construction for their roofs. The filtered water reservoir at Wilmington, Delaware, and the two circular reinforced concrete tanks at Lansing, Mich., are the structures referred to, both of which were described in the September 6th issue. In neither case did the engineer writing the description explain the cause for adopting the flat roof instead of the groined arch, although each called attention to the unusualness of the construction. These departures from the monotony of the groined arch roof will probably cause engineers to consider whether the conditions confronting them from time to time might not render some other type of construction preferable from a financial or other point of view.

BABY CARRIAGES AND GUTTERS.

The writer of a short article on another page of this issue calls attention to the fact that in the designing of street details no provision has been made for eliminating the difficulty of wheeling baby carriages across streets of ordinary construction in which there is a 6-inch drop or rise at each curb line. The point is certainly well taken for those sections of cities where baby carriages are numerous, which will include most of the residential sections, especially the newer ones. The use of gutter bridges or flush roadway crossings would meet the objectionable feature pointed out and also make walking easier for all pedestrians; but where these are not provided there would seem to be no good reason why the plan proposed by him of sloping the sidewalk down to the gutter level, omitting the curb for a length of 30 or 40 inches, is not practicable, although the placing of it at the junction point of the curb lines would seem to have several objectionable features. Such an incline placed just back of the cross walk would be practically a duplicate of the construction employed where driveways are carried across sidewalks, except that it could be made much lighter and also probably steeper and thus occupying less width of the sidewalk space.

As to the advantages suggested—that it would be appreciated by the users of bicycles and wheelbarrows, also—this is, in our opinion, a decided disadvantage, since most cities have an ordinance denying the use of the sidewalk to such vehicles, and anything which encourages a violation of this ordinance is objectionable. A construction which would offer practically all the advantages for baby carriages and at the same time interfere with the use of the crossing by bicyclists is the use of the flush crossing with a gutter cut through it. Such a gutter, a foot wide, can easily be crossed by baby carriages witout a jolt but are impracticable to bicyclists and difficult for wheelbarrows. This, however, requires the elevated crossing construction, which is decidedly objectionable where traffic uses the sides as well as the

center of the road. Where elevated crossings are not used, the suggestion given in the article is perhaps the best solution, where any seems to be called for.

LOWER LIGHT AND WATER RATES.

Beginning September 15, the Greenwood Light and Water Plant of Greenwood, S. C., has put in effect a lower rate for water and electric current "to aid the people in meeting the high cost of living." This plant, which is municipally owned and operated, has long granted very low rates, meanwhile running at a profit. The new rates for water are 15 cents per thousand up to ten thousand gallons and 12½ cents for all over that amount, with a minimum charge of 50 cents. The charges for power are 8 cents per kw. h. up to 100 kw., 7 cents for all over 100 and less than 500 kw. and 5 cents for all over 500 kw. A special rate of 3 cents is given for heating and cooking, or, with a minimum of $5 per month, a flat rate of 2 cents per kw. The minimum monthly charge is 75 cents. Daylight power service varies from 7 cents to 2 cents, depending on the quantity used. All rates are slightly increased for those living outside the city limits.

MUNICIPAL WORKS RATE REVISION.*

Summary of and Conclusions from Investigation of Water Rates Made by City of Waltham.

We attempted to provide for a period of five years in Waltham. It is a very difficult task to plan so far ahead. The writer knows of one case at least where provision for a fair return is made by giving the water takers an annual discount. The surplus, if there is any, is returned to them in this way each year, while the rates remain unchanged.

While it is a fact that we would, if making a new study of the rates today, follow practically the same general course that we did in 1915, it should be stated that subsequent experience and reflection call for some modifications in the program. In the main, however, the methods adopted in Waltham were simple and direct and in retrospect seem wise. Here is a basis for further revision which can be followed from time to time as conditions change.

The writer believes that it is only fair and logical for the Water Department to pay taxes on its property, and also that the city should be charged a fair rate for what water it uses as well as for hydrant service. As a basis, therefore, for rate fixing, he would charge a fair price for everything furnished the city and, in return, hold the Water Department to a strict accounting for all it receives. He would not, however, provide for a franchise tax. If it had received but $50 per hydrant, the Waltham Water Department could have paid taxes on the value of its plant and in 1916 would have made a further profit to the department of more than $3,000 on the deal.

The evil practice of taking water works earnings for general municipal expenses should be stopped. There ought to be some law to prevent an improvident city government from using the water takers' money to keep down the tax rate and so pull some politician's "chestnuts out of the fire." This has been done altogether too often.

The great advantage of an attempt to inform the public is, of course, to make clear to all the necessity of looking ahead. Without a careful foresight as to the expenditures which are sure to be required as well as the probable additional demands, there is always danger that the public may call for the distribution of any surplus which may temporarily accumulate. It is not necessary to emphasize the difficulty in increasing rates to cover a shortage as contrasted with the ease of a reduction. Arguments in favor of a reduction in rates always meet with a favorable reception, and they can be answered the more effectively the more widely the real facts are disseminated. Frequently they are advanced by parties who ought to be fully posted, but who, for reasons of their own, prefer to cater to popular sentiment rather than to use their influence to the real advantages of the public, and appeals such as this cannot be ignored or overlooked with safety. They can only be offset by a painstaking exposition of the true situation.

One of the most effective of the arguments which are advanced is based upon the feeling that the poor ought to get things as cheaply, if not more cheaply, than the rich. In Waltham this has gone so far that an ex-mayor is actually advocating in the public prints a rate of one and one-quarter mills per cubic foot for a minimum annual consumption of 4,000 cubic feet, and a rate of one and one-half mills per cubic foot for a consumption anywhere between this 4,000 and the point where the wholesale rate begins to apply. This in place of the rates of two mills and one and one-tenth mills for domestic and wholesale consumption which now apply. This is quite antipodal to the famous Vanderbilt policy and serves to emphasize the fact that the idea that those who have money must pay the way for those who have little or none is very popular today and that, whatever we may think of it, it has got to be reckoned with.

We sympathize with the industrious poor man, who is raising a family of children or who has raised such a family, many of whom are just now offering their lives to the country. We believe that such men will have more to say about these matters in future than in the past. We would surely like to have them get their part of the water supply at cost. We sympathize also with the great middle class which seldom complains, does most of the real thinking in the world, and is subjected to a constant grinding between the "upper and nether millstone."

The wholesale user now gets the low price in Waltham and in most other places. He also gets the free fire service. Perhaps this is right to a certain extent, but we must bear in mind that the poor man is becoming fully as important an element in democracy as his richer brother. It is well, therefore, in America, and in these times, for the management to consider this element in municipal service. It's no use to be officially blind to the signs of the times.

The question of relative rates for different services is, however, only a part, though an important part, of the problem. The main question is rather the necessary amount to be charged upon consumers in order to cover cost. This question, the writer maintains, can be solved satisfactorily only by careful study of future developments, based upon the lessons of the past. There is no panacea for all the difficulties of rate fixing; but the ideal for which we must strive, namely, a square deal and equal privileges for all, can only be reached when we have acquired sufficient wisdom from experience to decide how long to rest upon established order and when to cut loose and go ahead.

*Concluded from page 286.

STREET NAMES IN CURBS.

Tucson, Ariz., is to abandon the use of wooden street-name sign posts and instead will have the letters depressed in the concrete curb and painted black. The city engineer informed the city council that this could be done by city labor at a cost of about 80 cents per corner, and on the strength of this council decided on September 5 to authorize this construction.

The WEEK'S NEWS

State Highway Progress in Oregon, South Dakota, West Virginia and Tennessee—Infantile Paralysis in Chicago and West Virginia—Infant Mortality Reduced in Big Cities—More Wanaque Litigation—Firemen's Labor Conditions in Duluth and Yonkers—State Control of County Work—Philadelphia Mayor Mixed Up in Election Murder—Progress on Hetch-Hetchy—Indianapolis Gas Shortage—Metering Steam Heat.

ROADS AND PAVEMENTS

Road Laborers May Work Overtime.

Salem, Ore.—In an opinion to labor commissioner Hoff, attorney-general Brown has held that the highway commission is empowered to declare highway work an emergency under the eight-hour law, and work men on road work over eight hours a day, provided they are paid for the overtime. The highway commission recently passed resolutions declaring the construction of certain highways to be emergencies.

Road Finances in South Dakota.

Pierre, S. D.—If the different counties are ready to meet their share of the expense, South Dakota will spend $1,000,000 on highways within the next year and keep up the expenditure for several years. The money is to come from the counties themselves, the state and the national government. The state highway commission is composed of governor Norbeck, state engineer Derr and Frank S. Peck, the engineer who has had supervision of the construction of highways in Lawrence county, which has built more hard surface roads the past few years than any other county of the state. This board recently organized. The board will work along lines of highway construction which the federal government requires, and when they meet these requirements they will have a quarter of a million dollars of government funds available this year, and a like sum at the end of June next year. The state appropriated a quarter of a million dollars of which $200,000 have been apportioned, and the balance is being held for emergency work in the projects which are to be looked after for the year. Under the apportionment of state and federal funds Minnehaha county would be asked to raise a little more than $47,000 local funds to secure the benefit of the state and federal appropriations. Roberts county would have to raise almost $26,000 to get its share.

State Road Aid in West Virginia.

Charleston, W. Va.—The state road commission recently completed its apportionment of state and federal aid funds among the counties of the state for use in construction of Class A roads, based upon the amount of revenues received from issuing automobile licenses and tags, in addition to funds available from federal aid. The total sum apportioned is $435,860, of which Kanawha gets the largest amount, $12,160; Pocahontas second, with $12,065; Randolph third, with $11,875; Greenbrier fourth, with $11,400. Each county is required under the state road law to contribute a sum equal to the apportionment given it, and as much more as its county court desires to put in its road building. The commision at the time of the apportionment had collected the following:

Automobile licenses 1 to 26,400, inclusive	$291,102.31
Dealers' licenses 1 to 406, inclusive	6,075.56
Chauffeurs' licenses 1 to 1410, inclusive	4,322.05
Motorcycle licenses, 1 to 600, inclusive	3,001.19
Total	$304,606.19
Refund to County and State Institutions	128.90
Balance	$304,477.29
Total expenditures to date, including tags	18,252.52
Net Balance	$286,224.77
From Federal Government 1917 apportionment	52,270.46
From Federal Government 1918 apportionment	104,540.92
Total balance of fund	$443,036.15

The commision has found that there are approximately 4,588 miles of Class A roads to which it has apportioned $435,860, feeling that the collections for the remainder of the fiscal year will take care of the unexpected appropriation for the administration work of the department. According to the law passed by the last legislature, Class A roads must traverse the counties in such a direction that they shall link up with other roads of the same class in adjoining counties, and at least one of the two Class A roads in each county must pass through the county seat. In general these roads will run east and west and north and south. The law provides that the state aid is not applicable unless the provisions of the law are fulfilled.

Engineer Wins Bonus for County Work.

Wilkes-Barre, Pa.—David A. Keefe, of Athens, Pa., engineer for Luzerne county in the construction of the Nanticoke bridge, is entitled to a bonus of $2,500, offered him by the county commissioners if the bridge were completed in a stated time. Opinion handed down by judge Strauss sustains the contention of the engineer in the latter's suit against the county. County controller Fuller R. Hendershot refused to pay the bonus. He claimed there was no legal consideration and that no service was performed, and therefore the county commissioners exceeded their authority in entering into a contract that would grant a bonus. Keefe promised to have the bridge completed for traffic within one year. The bridge was opened within the year, but not completed until about a month after the allotted time, engineer Keefe claiming that the county was responsible for this delay. Keefe's contract was dated February 13, 1913, and he was to prepare the plans for the bridge and oversee its construction. He was to receive five per cent of the cost of the bridge as his commission and provided the bridge was completed within one year he was to get a bonus of $2,500. The Dravo Construction Company of Pittsburgh received the contract and began work on July 14, 1914. The bridge was opened within the year, but there were some minor details to be arranged.

Tennessee Highway System Planned.

Nashville, Tenn.—The Tennessee highway commission has laid out a system of state highways following weeks of careful consideration of the state's many road problems. The state highway engineer submitted a report showing in detail the character and condition of every mile on the Memphis to Bristol highway and the Dixie highway, the two important thoroughfares, which will claim the attention of the department this year. This report carried estimates of the cost by counties to improve the missing links in these two highways, which will total approximately $1,350,000. When these are completed the state will have, at least, one good highway entirely across the state from the northeast corner to the southwest corner, and another across the middle of the state from the northwest to the southeast. These two roads cross at Nashville, the state capital, and it is claimed will serve two thirds the population of the state, besides giving tourists good roads in four directions through the state. Other state highways will be taken up next year. Work has been started in Hamilton and Franklin counties. "For years the Cumberland mountains have stood like an almost impregnable wall dividing and separating middle and east Tennessee," said Chairman Crownover of the commission. "We have been almost like two separate peoples, but we are going to

stretch two ribbons across this mountain." In the plan both the Memphis to Bristol and the Dixie highways pass through Rutherford county and as the county has failed of its own initiative to provide a right of way free from toll gates the commission directed the engineer to proceed at once to survey a road along the most direct and feasible route from Nashville to Murfreesboro and from Murfreesboro to Woodbury. Following the survey condemnation proceedings will be instituted and the county will be required under the law to pay all costs and damages.

SEWERAGE AND SANITATION

Chicago Fights Infantile Paralysis.

Chicago, Ill.—Twenty-five quarantine officers have been named by health commissioner Robertson to aid in the city-wide fight on infantile paralysis in Chicago. Funds for the work have been promised by the city council finance committee. A score of new cases each day has brought the total up above 120. Dr. Robertson has asked Peter Reinberg, president of the county board, to permit tuberculosis patients at the county hospital to be transferred to the municipal tuberculosis sanitarium to make room for the children sent to the county hospital with infantile paralysis. He has put new help to work in the health department laboratory to assist in the movement to stop the spread of the disease. Precautions of every kind are being taken in schools.

Federal Health Service Helps Fight Typhoid.

South Bend, Ind.—A hundred cases and several deaths due to typhoid have aroused the city to take vigorous measures to combat the epidemic. The city has called the United States Public Health Service to make a survey, but so far the origin of the epidemic has not been definitely traced—the water and milk supplies being suspected. Sanitary engineer John Diggs and Dr. Will Shimer of the state hygenic laboratory were sent to the city by the state board of health. Remedial measures for the immediate control of the epidemic were put in operation by city officials and the people of South Bend upon the advice of Major J. O. Cobb, of the United States public health service. The recommendations of Major Cobb were: Treatment of the city water supply by the installation of a chlorination apparatus. Boiling of all dug well water. The use of pasteurized milk or of boiled milk. Vaccination against typhoid. As a result of a conference of members of the board of health, mayor Keller, Major Cobb and the latter's assistant, Lieut. C. D. Akin, it was decided to institute these measures at once, regardless of the source of infection. The city officials took steps to provide a chlorination apparatus. The city health department and the federal health service advised that all water, city and well water, be boiled for three minutes. "Insanitary outhouses in use in South Bend, shallow wells that are found in the city, unprotected milk supply and the fact that there are always a few cases of typhoid in the city are the conditions that have caused the present typhoid epidemic," was the latest statement made by Dr. Will Shimer, of the state hygenic laboratory.

To Keep Disease Out of Army Camp.

Battle Creek, Mich.—Arrest, court-martial and imprisonment for any soldier who stops a woman on the street or is otherwise insulting; isolation and loss of pay for any soldier who contracts disease—that is the war department's program for soldiers and residents at Battle Creek and Camp Ulter. Reports from physicians on every case of venereal diseases brought to their attention, and isolation of the victim as strictly as though suffering from smallpox are planned, according to a report from colonel William H. Powell, sanitary inspector of the local war recreation board. Battle Creek will be well patrolled by provost guards, with orders to arrest any soldier who insults a woman or girl. Court-martial will follow, with terms of imprisonment based on the gravity of the offense. Furthermore, the man's name will be posted where every other soldier can read it, together with the punishment given him. Twice each month every soldier will be given a medical examination. All will, of course, start clean, "and the first sign of contracted disease will mean that the man has trodden forbidden paths." He will at once be placed in an isolation hospital, and his pay will automatically stop. At a meeting of the war recreation board Dr. J. H. Kellogg pointed out the city's part of the program. The state law asks physicians to report every case of venereal disease and asks civil authorities to isolate the victims. Neither is done. A movement is now on in Jackson, Kalamazoo and Battle Creek in particular to enforce both. A committee is to wait on chief of police W. H. Farrington and ask that as fast as syphilis victims are found they be detained. The entire war recreation board voted for this and for approving resolutions adopted at a conference of state authorities on sex diseases, in Jackson, asking governor Sleeper to name a commission to place venereal diseases under the same control as now checks smallpox, tuberculosis, and other contagious or infectious diseases.

Big Cities Reduce Infant Mortality.

New York, N. Y.—"The death rate among babies in the larger American cities has been reduced 11% since 1910, according to the infant mortality survey just completed by the New York Milk Committee. This reduction has been made among cities of 100,000 population and over. The smaller cities have not done so well. The reduction in cities between 50,000 and 100,000 population is only 2 per cent while those under 50,000 show an increase of 5 per cent. The general reduction is 9 per cent. The survey covers 150 of the largest cities in the Unitd States since 1906. The marked decrease in infant deaths did not begin until 1910 when organized infant welfare work became general. These 150 cities represent one-fourth of the population in the United States and they report 670,000 living births and 68,500 deaths under one year of age for the year 1916, making an infant mortality rate of 100 baby deaths for each 1,000 births reported," says J. H. Larson, secretary of the committee. "Or stated more clearly, it means that one baby out of every 10 born dies before it is one year of age in the cities of the United States with a population of 25,000 and over. Assuming that the statistics for these cities may represent the statistics for the entire population of this country, then we would have approximately 2,750,000 births and 275,000 deaths under one year annually. Besides this, it is now known that there occurs annually about half as many stillbirths as deaths under one year. Through general education, the baby milk station movement and other efforts along kindred lines, baby deaths have been reduced 9 per cent since 1910. It is recognized that through maternity care stillbirths can be reduced 22 per cent and deaths during the first month after birth can be reduced 28 per cent. Nearly half the deaths under a year are of babies less than a month old.

This country, following the example of Germany and Great Britain, is now beginning to think of a national maternity care program. When this movement gets under way it should save at least 75,000 mother and baby lives annually." During 1916 there were 68,500 deaths of babies under one year of age against an average of 75,075 for the 5-year period 1906-1910, showing a decrease of 6,536 infant deaths. The death rate of babies under one year of age per 1,000 born shows a corresponding reduction to the decrease in numerical deaths. The lowest infant death rate in the country in 1916 among the cities of 100,000 or over, was in Portland, Ore., with a record of only 55 baby deaths per 1,000 births. Fall River, Mass., is the highest with a rate of 163. In the second group, those with a population of 50,000 to 100,000, Hoboken, N. J., has the low rate of 77 against San Antonio, Tex., which has the high rate of 246. In the cities with populations of 50,000 and under, Brookline, Mass., leads with the remarkably low rate of 32 against Austin, Tex., whose rate was 182. Though there has been a general decrease for all the cities since 1910, the reports for 1916 compared with those of 1915 are not so encouraging. In cities of over 100,000 population there was an increase in the number of baby deaths in 1916 of 1,573. Thirteen cities in this group showed reductions, New York City leading with a decrease of 1,048, and infant mortality rate of 93, the lowest in the history of the city. Other

cities of the group showing decreases were: Philadelphia, 65—rate 101; New Orleans, 156—rate 96; Washington, 12—rate 105; Jersey City, 94—rate 102; Rochester, 2—rate 82; St. Paul, 56—rate 67; Denver, 40—rate 84; Portland, 17—rate 55; Oakland, 23—rate 65; Scranton, 139—rate 85; Grand Rapids, 8—rate 115; Spokane, 41—rate 57; Albany, 62—rate 96.

The cities in this group showing increases were: Chicago, 683—rate 111; St. Louis, 62—rate 89; Boston, 10—rate 104; Cleveland, 118—rate 107; Baltimore, 150—rate 118; Pittsburgh, 114—rate 111; Detroit, 548—rate 112; Buffalo, 115—rate 113; San Francisco, 61—rate 79; Milwaukee, 182—rate 113; Cincinnati, 118—rate 97; Newark, 83—rate 89; Los Angeles, 21—rate 69; Minneapolis, 121—rate, 87; Indianapolis, 26—rate, 86; Providence, 34; Louisville, 31—rate 108; Columbus, 83—rate 89; Toledo, 156—rate 111; Worcester, 94; Syracuse, 31—rate 98; New Haven, 55—rate 89; Birmingham, 24—rate 110; Richmond, 91—rate 136; Paterson, 58—rate 110; Fall River, 8—rate 163; Dayton, 76—rate 98; Lowell, 21—rate 155; Bridgeport, 67—rate 96.

Of the cities from 50,000 to 100,000 population there was an increase of 238 deaths. Fifteen cities in this group showed decreases as follows: New Bedford, 10—rate 132; San Antonio, 7—rate 246; Lawrence, 81; Yonkers, 48—rate 89; Somerville, 10; Troy, 48—rate 94; Utica, 131—rate 110; Ft. Worth, 27—rate 84; Schenectady, 33—rate 77; Hoboken, 16—rate 77; Manchester, 8—rate 155; Ft. Wayne, 17; Brockton, 19—rate 93; Wichita, 19—rate 74; Mobile, 4—rate 101.

Seventeen cities of this group showed increases as follows: Hartford, 9—rate 101; Trenton, 123—rate 124; Reading, 86—rate 174; Salt Lake City, 64—rate 80; Lynn, 27—rate 80; Springfield, 35—rate 86; Des Moines, 8; Elizabeth, 29—rate 94; Akron, 82—rate 90; Wilkes-Barre, 23—rate 143; Erie, 83—rate 113; Harrisburg, 5—rate 104; Holyoke, 27—rate 181; So. Bend, 53—rate 110; Altoona, 28—rate 84; Springfield, 1; Canton, 33—rate 109.

Of the cities under 50,000 there was an increase of 755 deaths under one year compared with 1915. Out of the 71 cities in this group, 21 showed reductions as follows: Augusta, 18; Berkeley, 10—rate 47; Superior, 9—rate 119; Newton, 15—rate 67; Galveston, 8—rate 74; Everett, 1; Cedar Rapids, 8; Perth Amboy, 6—rate 118; Jackson, 24—rate 106; Lima, 18—rate 78; Orange, 13—rate 91; New Rochelle, 22—rate 68; Norristown, 27—rate 120; Brookline, 2—rate 32; Kingston, 1—rate 100; Wilmington, 11—rate 146; Madison, 2—rate 45; Montclair, 2—rate 60; Concord, 1—rate 76; Raleigh, 13—rate 132.

Fifty out of these 71 cities showed increases as follows: Binghamton, 31—rate 139; Lancaster, 16—rate 97; Springfield, 28—rate 80; Rockford, 37—rate 99; Sacramento, 13—rate 82; Malden, 5—rate 55; Haverhill, 18—rate 89; Lincoln, 10—rate 80; New Britain, 13—rate 94; Salem, 21—rate 99; Topeka, 2—rate 84; Wheeling, 7—rate 134; Macon, 11—rate 129; San Diego, 24—rate 69; Kalamazoo, 4—rate 70; Flint, 94—rate 111; Racine, 43—rate 115; Tampa, 10—rate 107; Elmira, 2—rate 93; Quincy, 7—rate 94; Springfield, 36—rate 133; Roanoke, 36—rate 122; Auburn, 37—rate 85; East Orange, 5—rate 59; Pittsfield, 88; Jamestown, 29—rate 101; Mt. Vernon, 1—rate 87; Niagara Falls, 28—rate 131; La Crosse, 16—rate 49; Pasadena, 7—rate 48; Austin, 18—rate 182 Colorado Springs, 13—rate 104; San Jose, 34—rate 94; Lorain, 61—rate 181; Easton, 20—rate 119; Zanesville, 13—rate 124; Poughkeepsie, 19—rate 116; Danville, 9—rate 86; Waltham, 18—rate 38; Newburgh, 1—rate 117; Newport, 4; Watertown, 12—rate 127; Nashua, 20—rate 117; Elgin, 1—rate 86; Battle Creek, 6—rate 77; Green Bay, 42—rate 166; Alameda, 7—rate 50; Cumberland, 29—rate 114; Sioux Falls, 15—rate 99; Reno, 7—rate 67.

Special Sewerage Funds Transferable.

Reno, Nev.—Holding that the 1917 amendment to the city charter of Reno clearly gives the city council authority to transfer to the general fund money held in a special fund for the construction of a sewage disposal plant the state supreme court has granted the petition of the city for a writ of mandamus compelling city auditor C. H. Stoddard and city treasurer D. W. Dunkle to make the transfer forthwith. The opinion of the court was written by justice Sanders. Justice Coleman wrote a concurring opinion, and chief justice McCarran dissented in an opinion of considerable length, in which he discusses with considerable detail the various acts of the legislature relative to pollution legislation. Justices Sanders and Coleman each hold that the question of the pollution of the Truckee river or any other stream in the state was not invoved in the suit. In his concurring opinion justice Coleman says the "legislature decided to leave to the direction of the council what disposition to make of the money in the special fund." The petition for mandamus was filed after the city auditor and treasurer, who also are county officials, refused to transfer $25,895.40 collected through a special tax for the purpose of constructing a sewage disposal plant and standing in the name of a special fund for that purpose. The transfer was ordered by unanimous vote of the city council, the purpose being to place it in the general fund, to be used in the purchase of motorized fire department apparatus. When the case was presented to the supreme court attorneys for the city treasurer and auditor contended that the money sought to have transferred belonged to a special fund and under an act of the legislature of 1915 could not be transferred. They also contended that under anti-pollution legislation the city would face prosecution by the state in case the money was not used for the purpose for which it was accumulated.

Poliomyelitis in West Virginia.

Charleston, W. Va.—Ninety-four cases of infantile paralysis were reported to the state department of health in the month of August from eighteen of the fifty-five counties of the state according to a statement on the subject. Twenty of the cases were reported from Marion county, fifteen from Harrison and twelve from Wood. The other cases were scattered as follows: Barbour county, three; Braxton, two; Gilmer, two; Lewis, seven; Marshall, one; Mineral, four; Monroe, one; Ohio, four; Preston, four; Taylor, three; Ritchie, three; Tucker, four, Upshur, nine; and Wetzel, one.

Organized Hygiene Works in Dayton Schools.

Dayton, O.—The methods of teaching hygiene and gymnastics in the schools of the city are to be radically improved and put on a more scientific basis. Dr. F. L. Bucher, who was formerly medical inspector of the city's schools, has been appointed director of hygiene and supervisor of the teaching of hygiene for three years, beginning Sept. 1, 1917. His duties include the formulation of rules, methods and regulations for the work, to be improved by the superintendent of instruction. His salary will be $3,600 a year. Dr. Bucher has already developed plans for a system of instruction to be called "selective gymnastics." The principle is the thorough examination of every child, who is to be placed in a special group and given a special form of exercise depending on needs. Heretofore, as is the common practice, all children, regardless of age or physical condition, have been put in regular classes and given the same exercises. Every child is now to be examined with the aid of a recently invented machine, a type of dynamometer. Weakness in the various sets of muscles will thus be discovered and proper exercises to build up the organs assigned. Medical and dental inspection will continue, as under existing regulations. The teachings of hygiene will be supervised and a course of study and manual will be provided for the regular and systematic teaching of the principles of hygiene. The practice of corrective gymnastics will be improved.

WATER SUPPLY

City Wins in Wanaque Litigation.

Newark, N. J.—The supreme court at Trenton has decided the litigation over the development of the Wanaque watershed in favor of Newark. According to justice Black the right of the State Board of Conservation and Development to attach reasonable terms and conditions to its approval of the application of the North Jersey District Water Supply Commissioners for consent to divert water from the Wanaque for an additional supply for Newark and such other municipalities as may join was upheld. The decision is adverse to the Society for the Establishment of Useful Manufactures, which declares it has valuable rights in the Passaic river, of which the Wanaque is a tributary, and the society brought certiorari proceedings questioning both the right of the conservation board to confer authority to divert upon the district board and the reasonableness of the conditions sought to be imposed. Among other things the Society of Useful Manufacturers contends that the jurisdiction of the board of conservation was confirmed to giving or withholding its consent to the proposed diversion, and to nothing else. After reviewing the legislation bearing upon the subject justice Black concluded by saying: "We think it is too plain for argument that under this legislation the Board of Conservation and Development had not only implied, but expressed power to attach to its approval and consent the terms and conditions as shown in the record. In addition in what seems to us to be the clearly expressed intention of the legislature, these terms and conditions

are all strictly germane to the subject matter that was then before the board for action. They are necessarily incident to make effective, if not efficient, the approval and consent of the board. The construction contended for by the Society for the Establishment of Useful Manufactures is too narrow and artificial. It would strip such approval and consent of its vitality, and as we think in direct opposition to the expressed intention of the legislature." Following this, an order has been filed in the supreme court by justice Swayze dismissing the certiorari proceedings instituted by the Society for Establishing Useful Manufactures, involving the attack upon the action of the North Jersey District Water Supply Commission in granting permission to the city of Newark to use the Wanaque as an additional source of water supply. The motion to dismiss the writ heretofore allowed was made by Spaulding Frazer, as counsel for the North Jersey District Water Supply Commission. It is understood that the S. U. M. will file an appeal carrying up for review to the court of errors and appeals the judgment of the supreme court. The case may be taken up to the federal supreme court. Since early in the summer the water commission has been prevented by the court's action from prosecuting any work toward the development of the shed. In the meantime the date when Newark will have to get more drinking water is rapidly drawing nearer. For the question of the development to be thrown back upon the courts again for decision would mean a long delay and might force the city to buy additional water from the East Jersey Water Company. When the appeal is taken, it is the intention of the North Jersey District Water Supply Commission, acting for Newark, to ask the court to raise the stay which the appeal would automatically impose on further development proceedings. In applying to the court not to permit the appeal to hold up the development project, Mr. Frazer would argue that the case is one of public necessity, demanding immediate action by those concerned with supplying additional water. It would be pointed out that Newark's water consumption has reached the maximum of its supply and that it would take from two to three years under most favorable conditions to make the Wanaque water available. Meanwhile October 18 is the date set by the commission for a hearing at which may be represented such municipalities as desire to enter the Wanaque watershed development project. At this hearing Newark through its board of works will make a new application to the Water Commission to construct a reservoir and pipe line which will make possible an additional supply of 10,000,000 gallons of water daily for this city. It is not expected that any other municipalities will be ready to join in the project at that time. After the hearing the board of works and the water commission can proceed to make a new contract, such action being necessary because of the court proceedings that were brought by the Society for Establishing Useful Manufactures, resulting in the abandonment of the first contract.

Fuel Shortage During Change to Electrical Operation.

Mansfield, O.—State aid was sought by city officials in securing coal for use at the Mansfield waterworks main pumping station when it became apparent natural gas could not be used longer. For several days it had seemed that gas being supplied by the Medina Gas & Fuel Company through the Mansfield Gas Light Company could not be continued. Gas conditions throughout Ohio have become acute and in every direction gas has been taken from manufacturing concerns and held for domestic use. The normal pressure of gas used at the pumping station is 8 oz. At the plant the pressure was at 3 oz. This made it impossible to force water into the high lines in the southern and western sections of the city at a pressure even near normal. Through the efforts of R. E. Burger, general manager of the Mansfield Electric Light & Power Company, the Medina company was induced to give the city sufficient gas to maintain water service until such time as other arrangements could be made. This aid lasted only a day or so. Local coal dealers said they were powerless to relieve the situation. State aid to secure the necessary supply for the city was sought through the office of John Roan, of the state clearing house office. Enough coal was promised to take care of the plant. The waterworks plant is now in the midst of improvements and changes which when completed will permit the plant to be operated entirely by electricity purchased from the new plant of the Mansfield Electric Light & Power Company. The plant can now use 100 horsepower or about two-fifths of the total load. By December 1 service director Hursh believes that the entire plant will be in readiness to be operated electrically. In the past the plant has used 20 tons of coal a day, but now it uses 12 tons and the difference is made up by current.

Hetch-Hetchy Railway Completed.

San Francisco, Cal.—San Francisco has added another sixty-eight miles of railroad ready for operation to the municipal system, city engineer O'Shaughnessy having announced that the Hetch-Hetchy Railway is completed to the dam site, with the exception of ballasting, which will be done during operation. It is the city's policy to operate the road as a common carrier. More than 230,000 tons of freight will be hauled eastward, consisting of construction equipment and materials for the Hetch-Hetchy dam and the upper division of the tunnel aqueduct. The heaviest traffic will occur in 1919, when, it is figured, an average of 320 tons a day will be hauled for the city. The railroad passes through forests of large extent, which have not as yet been logged because of their remoteness from railroad transportation. It is expected that close to 2,000,000,000 board feet will be cut and marketed when the city provides adequate transportation facilities. The revenue from hauling this lumber will help in some measure to defray the cost. Beginning at Hetch-Hetchy Junction, a station on the Sierra Railway, twenty-six miles from Oakdale, the road runs almost easterly to Groveland, the headquarters of San Francisco for the Hetch-Hetchy work; thence it descends to the south and middle forks of the Tuolumne river, which are crossed on trestles, and finally ascends the Poopenaut pass, where an elevation of 5,064 feet is attained. From the summit the road descends on a 4 per cent. grade to Hetch-Hetchy dam site.

City Protests Against Water Report.

Meridian, Miss.—The city officials and citizens have been aroused to protest against an order recently issued by the United States Public Health Service to railroads forbidding the use of Meridian water. This "slur" against the purity of the local supply was hotly resented and denied. Mayor John M. Dabney gave out the following statement:

The mayor and commissioners have been, as calmly as possible, awaiting the discovery of the charges against the water supply of the city of Meridian since the embargo was placed upon the water for interstate use. The water department of the city of Meridian has throughout the years of municipal ownership improved each year the condition of the water supply. To undertake to estimate the degrees of advantage today over the degrees of advantage of five or ten years ago would, perhaps, be impossible. Throughout that time, however, it has been realized that the lack of control of the entire water shed has been undesirable. This has been realized by city officials in the past as at present; and, during Mr. Parker's administration under the commission form of government, an effort was made to begin to acquire this land, which failed because of petition against it. The change in the position of the public road by reason of the constructon of the new reservoir to the east side of the ponds was a mistake, but it was a mistake of the whole people. Mr. Worrell has contended for years that that road should not be there; and when army officials visited our city a few months ago this immediately caught their attention. It will be seen in the letter which is appended hereto that this is one of the points that the government contends for. Analyses of the city water have been for years made by Prof. James M. Caird, of Troy, N. Y., at stated intervals, and in June of the current year the analysis showed an excellent condition. This will show the absolute good faith of the water department in continuing to supply water to the city.

I have no comments to make on the seemingly arbitrary act of the Public Health Service in its method of dealing with us. The exigencies of the present war situation, perhaps, may necessitate an extreme scrupulousness that at other times might not be deemed necessary. I cannot refrain from remarking, however, on the strangeness of the assumption which we seem to be driven to, that there should be a difference between the value of the life of a man on an interstate railroad train and the value of the lives of the citizens of Meridian. Reasonably and justifiably, I am more jealous of their lives and happiness than I am of the world at large, but, in caring for my own people along this line, I should be caring for all who travel through Meridian, whether by rail or motor car. There-

fore, why, when the government saw fit to order the railroads to discontinue the use of our water, it did not at the same time advise the city of Meridian that it had done so, and at least hint to us that because of the fact it had felt that travelers should not drink it, it would advise us to so advise our citizens, I cannot understand. I am pleased to state that an order has gone for a chlorinating plant, which will be installed at once, pursuant to the recommendations in the letter from the Public Health Service. In conclusion, I state that thus far there is no worse condition in our water than possibility of future danger, as shown by government analysis. No typhoid is found.

In a letter by J. Holmes Smith, Jr., of the federal health service the reasons given for condemnation of the water supply are as follows:

1. The existence of a number of negro habitations along the water sheds of the several streams supplying the city of Meridian, several of these habitations being in such a position that a case of typhoid fever might readily be the cause of an epidemic in the city wherever the water was distributed.
2. Because of a public road passing directly through the before mentioned water shed, this road allowing the passage of all classes and characters of persons, vehicles, etc.
3. Because of some doubt as to the efficiency of the filtration plant in the city of Meridian, owing to the fact that the samples of water obtained came just within the limits prescribed as a bacteriological standard for drinking water supplied to common carriers engaged in interstate traffic.
4. Because the vital statistics of the city of Meridian are apparently very poorly kept and no definite idea could be obtained as to the location of certain cases of typhoid fever and other water borne diseases.
5. Because of the high rate of typhoid fever cases per one hundred thousand of the population.

The recommendations for the correction of these conditions are the following:

1. The abandonment of all habitations along the water sheds of the streams furnishing the water supply of the city of Meridian.
2. Closure to traffic of the roadway leading through water shed.
3. Installation of any necessary apparatus which will allow for the treatment of the water supply with liquid chlorine, this being considered about the most satisfactory and easiest method of treating same.
4. A routine bacteriological examination of the unfiltered and filtered water to determine the efficiency of the filters.

STREET LIGHTING AND POWER

Must Not Use Gas for Heating.

Indianapolis, Ind.—The Citizens Gas Company has issued a warning to all householders to discontinue the use of gas for heating purposes in cases where the gas heat is used as a substitute for heat from coal. The warning does not apply to gas for kitchen stoves, for hot water heating and for manufacturing purposes. J. D. Forrest, secretary and general manager of the company, said that the prohibition of the use of gas in grates and for heating purposes where coal should be used is not temporary, but will continue all the winter season. Mr. Forrest said the company now has a sufficient supply of coal on hand, but the fact that thousands of householders have neglected to put in their supply of coal for heating purposes and are using gas as a substitute has strained the plants of the company beyond their capacity. He said that on account of the extraordinary conditions now existing the capacity could not be increased before 1919, and at no time would the company be willing to provide gas as a substitute for coal heating. The company's statement gives the warning that consumers who continue to heat their houses with gas may be cut off from gas service. The gas supply for cooking purposes on several days has been so low that it was not sufficient in many parts of the city.

Public Service Commission Engineer Fined.

Los Angeles, Cal.—Within a few hours of the time set by superior judge Monroe for formally entering his findings in the contempt charges growing out of the legal battle between the city and the Los Angeles Gas and Electric Corporation over construction of power lines in Los Angeles, W. B. Mathews, counsel for the board of public service, filed an appeal in the case in the district court of appeals. Attorney Mathews applied to the district court for a writ of review from the judgment of judge Monroe in ordering E. F. Scattergood, chief electrical engineer of the public service commission, to pay a fine of $200 or serve 100 days in the county jail. The fine was based on a contempt charge of having failed to obey an order preventing the city from placing power lines along York boulevard close to those of the corporation. The appeal acted as a further stay of execution against the decision of judge Monroe. If the writ is granted by the state court, the legal contest as to the irregularity of the power corporation in its attempt to crowd the city lines from streets probably will be reopened before the higher tribunal. The answer of the city to the latest attempt of the Los Angeles Gas and Electric Corporation to hinder the construction of the city power system was to purchase $237,000 worth of the power bonds with sinking fund money. The money thus obtained by the municipal power bureau will be used in futher extension of the municipal lines throughout the territory south of Exposition boulevard, where the gas corporation has had a monopoly of the electric business. The council voted to appropriate the money from the sinking fund to buy the aqueduct power bonds without delay. Mayor Woodman began signing the bonds immediately after a conference with W. B. Mathews, special counsel, and R. F. Del Valle, president of the public service commission. The mayor declared emphatically that by no means must the city let up in the fight to extend the city lines into the territory of the Los Angeles Gas and Electric Corporation, no matter what devices are resorted to to interfere with the city power project. "The $200 to pay engineer Scattergood's fine has been raised almost entirely in $1 subscriptions, many of the dollar checks coming from large corporations, as well as home-owners who sympathize with us in our fight," said president Del Valle.

Meters for Steam Heat.

Springfield, Ill.—Flat rates for heating service are to be withdrawn by the McKinley companies in various Illinois cities, and meter measurement systems installed as a result of a compromise agreed to here between representatives of the companies and patrons appearing before the state utilities commission. In effect the compromise is that the service shall be based on meter measurement, but the meter rate shall be so computed that it will result in the same bill as the flat rate. W. A. Shorb, chosen by the Decatur Association of Commercie to represent it was responsible for the compromise suggestion which temporarily at least halts the proceedings before the state utilities commission on the petition of the McKinley companies for permission to withdraw the flat rate for heating service and substitute the meter system of fixing the service fee. The question is to be left open for the approval of the state utilities commission until after the compromise has been given a fair test, perhaps during all of the winter season of 1918-9, when it will be approved by the state body. The company, if dissatisfied, may ask for an increase in rates or the patrons of the service may ask for a lower rate. Then the question will be on the cost of production and the service involved. Danville, Bloomington, Clinton, Champaign, Urbana, Galesburg and Decatur were represented at the hearing before the commission.

FIRE AND POLICE

Fire Alarm Contract Held Legal.

Plains, Pa.—An injunction brought by Mose Griffith against the Plains township commissioners and the Gamewell Fire Alarm Telegraph Company to ascertain whether the acceptance of the bid of the Gamewell Fire Alarm Telegraph Company by the township commissioners to install its system throughout the township and the awarding of the contract were fraudulent and should be declared null and void has been dismissed in an opinion by Judge O'Boyle. Griffith contended that the Gamewell Company did not submit the lowest bid and that the commissioners exceeded their authority in not awarding the contract to the Plains Electric Construction Company, the lowest bidders. In deciding the case against Griffith Judge O'Boyle says that "we cannot hold, after a careful investigation of the case, that the commissioners would be justified in awarding the contract to the company, of which the plaintiff was the sole member." In his opinion Judge O'Boyle

says: "It is fair to assume, and the evidence so shows, that immediately upon receipt of this bid, the committee discovered that the plaintiff in this case constituted the company, and further that he was never engaged in, nor had he any experience whatever in the installation of a fire alarm system; but on the other hand, was a real estate dealer, and the address which he gave, as some of the witnesses say, a dilapidated garage located on one of the streets in the township. It also appears from the evidence, that there was no one associated with him in the business when the bid was made out and presented to the commissioners. It also appears that there was no incorporated company, and that the name of 'Plains Electric Company' was called into being for the exigencies of the case. We have no hesitation in saying that the township officers were justified in selecting the Gamewell Company's bid in preference to the Plains Electric Construction Company, when they had before them the information that one hundred and fifty leading cities and towns, including Philadelphia and Pittsburgh, had already had this system in operation. It will be observed, upon examination, that the bid of the Plains Electric Construction Company permitted the institution of any fire alarm system, as its bid made no reference to the Gamewell system."

Firemen Join Union.

Yonkers, N. Y.—Members of the local fire bureau have made application for a charter of affiliation with the New York State Federation of Labor. The necessary signatures have been secured to the petition for a charter and, it is expected, the Yonkers firemen will shortly be recognized as members of the City Firemen's Union. It is said that the fire-fighting forces of 42 cities throughout the country, comprising a membership claimed to 3,000 men, are unionized. The sanction of the department heads has always been secured as the unionizing of men is for its moral influence. Under the rules of the Federation, firemen affiliated cannot take part in any strike or boycott and the question of salaries does not enter into the charter provisions.

Firemen Injured in Business Block Fire.

Bristol, Va.—What is said to have been probably the most disastrous fire in the history of Bristol wiped out four large buildings on Fourth street and caused a loss variously estimated at from $100,000 to $150,000. The blaze originated in the building occupied by the Reynolds Corporation and threatened to spread to the business district before it was gotten under control. Two men were injured and more than a dozen barely escaped with their lives when they were trapped on the upper floors and the roof of the building next door. They made their way to safety by clambering down ropes and hose hanging from the roof and the third and fourth story windows. Several firemen were injured. Each of the buildings was totally destroyed. The high brick walls at the Reynolds building and the other structures facing the street fell with resounding crashes to the street, littering a wide area with debris. Firemen narrowly escaped death time after time by falling brick and burning timbers. Several times their hose were burned under the falling walls when they were forced to retreat to the street for safety. It was conceded that the absence of a wind probably saved a large part of the business district from destruction. Members of the fire department say a high wind would have driven the flames to the nearby residences. In this event the firemen would have been utterly unable to cope with the situation, and the damage would probably have reached millions of dollars. The departments of both the Tennessee and the Virginia sides worked together.

Salary Increases for Firemen.

Duluth, Minn.—Salary raises for practically every member of the fire department have been provided for by the city council. The schedule of salaries has been revised following a number of conferences between the firemen and mayor Magney and commissioner Silberstein. No increase was given the chief or his two assistants. In the new schedule the rating of men has been changed somewhat. Lieutenants will now be rated above chauffeurs, some of whom up to this time have received the greater salary. In order to place lieutenants in their proper places, it was necessary to raise them from $92.50 to $102.50 per month. The secretary of the commission of public safety was raised from $30 to $35, but this includes only part of her salary, as she also occupies a similar position for the mayor at a higher salary. Most of the raises are of $5. The increase amounts to about $10,000 a year for the department. The old and new schedules follow:

		Old Salary.	New Salary.
1	Chief of department	$208.33	$208.33
1	First assistant chief	175.00	175.00
1	Second assistant chief	130.00	130.00
1	Secretary to commissioner	30.00	35.00
1	Fire warden	90.00	95.00
1	Supt. fire alarm	150.00	150.00
2	Engineers	95.00	100.00
9	Captains	100.00	105.00
10	Lieutenants	92.50	102.50
2	Stokers	90.00	95.00
11	Chauffeurs, 1 year	90.00	95.00
3	Chauffeurs 2 years	95.00	97.50
7	Chauffeurs 3 years	97.50	100.00
16	Pipemen-truckmen 1 year	75.00	80.00
29	Pipemen-truckmen 2 years	80.00	90.00
3	Pipemen-truckmen 3 years	85.00	92.50
35	Pipemen-truckmen 4 years	90.00	95.00
1	Watchman	25.00	25.00
1	Watchman, Dul. H.	15.00	15.00
3	Telegraph operators	61.50	70.00
2	Blacksmiths	95.00	100.00
1	Master mechanic	115.00	120.00
1	Lineman	85.00	90.00
1	Lineman	95.00	100.00

GOVERNMENT AND FINANCE

Mayor Involved After Election Brawl Murder.

Philadelphia, Pa.—Mayor Thomas B. Smith, police lieutenant David Bennett and Isaac Deutsch, candidate for select council, are charged with conspiracy in connection with the killing of a special policeman and the assault on assistant district attorney John H. Maurer and Frank Carey, opponent of Deutsch for ward leadership. The murderous attacks took place during one of the many Republican faction fights in the so-called "Bloody Fifth" ward during the primary elections. Thugs and gunmen from New York have been arrested and it is said that they have made statements involving a Philadelphia detective. It is charged that they were led in the rioting by policemen and that they have been promised high pay and immunity for anything they did. These outrages have shocked the city and plans have been adopted for the organization of an independent party for the purpose of breaking the so-called "contractors' ring," the Vare-Smith combination.

Bond Issue Defeated by Indifference.

Columbus, Ga.—While a majority of the voters approved the proposition, the issue of $177,000 in bonds for a number of improvements was defeated because the necessary two-thirds of the registered voters did not come to the polls. Only 779 votes were cast out of the total registration of 1,221. Very little interest was taken in the election. Of the $177,000, the election held recently for the purpose of trying to secure bonds amounting to $177,000. Of this amount $150,000 was to be used in securing better sewerage connection; $15,000 for paying for the city hospital annex, and $12,000 for erecting a new fire station and other fire improvements. The votes recorded were as follows: For sewers, 491; against sewers, 276. For hospital, 589; against, 155. For fire station, 597; against, 146.

State Must Approve County Work Specifiications.

Indianapolis, Ind.—Specifications for contracts for public work must be passed upon by the state board of accounts before the work may be awarded, according to a letter which has been sent out to all county auditors by G. H. Hendren, state examiner. The letter says: "In order that there may be no restriction of free and open competition in the letting of contracts for public buildings, bridges, gravel roads and drainage ditches, you are hereby requested to procure a set of duplicate plans and specifications of any such contemplated work and before advertising for bids send or cause to be sent a copy of the plans and specifications to this department for filing and inspection. When preparing plans and specifications, a

sufficient number of copies should be made for the use of prospective bidders and the local and state authorities. Thus the duplicate copy furnished this department by the county surveyor, civil engineer, architect or heating engineer, will only be a trifle more expense. Such duplicate plans and specifications will be at all times open for public inspection of contractors and will thus greatly increase the competition which should reduce the cost of construction to the taxpayers. This department will provide for the examination of all plans and specifications submitted by competent architects, heating and ventilating engineers and civil engineers free of charge and report to you irregularities, if any, within five days. If irregularities are found in any such plans and specifications, a proper notation of such irregularities will be made and your architect, civil engineer or heating and ventilating engineer will then correct such irregularities before advertising for bids. If no irregularities are reported, you may proceed to advertise for bids as provided by law. A copy of the advertisement for bids should be filed with this department for the information of the public and prospective bidders."

State Civil Service Commissions.

Washington, D. C.—According to a new report issued by director Sam L. Rogers of the Bureau of the Census, entitled "Financial Statistics of States, 1916," eleven states—Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Ohio, Illinois, Wisconsin, Kansas, Colorado, and California—maintain civil service commissions. The expenditures in the eleven states for the support of these commissions aggregated $358,486; and the greatest expenditure made for this purpose by any one state, $89,009, was reported for New York.

STREET CLEANING AND REFUSE DISPOSAL

Conservation and Garbage Decrease.

Albany, N. Y.—That citizens in New York State are heeding the appeal to stop wasting food is indicated by reports received from the cities showing the amount of garbage collected this summer and in 1916. According to a report made public by W. P. Capes, director of the State Bureau of Municipal Information, there has been a decided falling off this year in the amount of garbage collected in the cities of New York state which keep collection records. Only two of those reporting show an increase, caused probably by more efficient methods of collection having been introduced during the year. Comparisons were made by the bureau for the State Food Commission, the collections for June and July of this year and those in the corresponding months in 1916 being used. Following are some of the June decreases reported: Rochester, 693 tons; Manhattan, Bronx and Brooklyn, 5,953 cubic yards; Kingston, 20 tons; Cortland, 6 tons; New Rochelle, 666 cubic yards; Syracuse, 38 tons; Albany, 668 barrels; Utica, 5 tons daily; Buffalo, 1,069 tons.

New Garbage Collection Contract.

Flint, Mich.—In an attempt to get better service from the United Disposal & Recovery Company, which has secured a contract with the city to collect and remove garbage, a new contract drawn up by the city attorney has been adopted by the common council. The new contract, which is to remain in effect for 20 years, with the exception that the city reserves the option of the purchase of the entire disposal plant at the end of the first 10-year period, states in detail the service which is expected of the disposal company. Under the contract the company is required to construct not later than May 1, 1918, a modern, sanitary garbage disposal plant on a site which will be furnished by the city. The site for the disposal plant designated in the contract is located in Burton township and contains 8 acres. The city gives the site to the disposal company for the term of the contract, together with the railroad siding and other buildings that are already erected, and provides that the disposal company shall pay taxes on the property for the term of the contract. The clauses of the contract which govern the collection of the garbage provide that the disposal company "shall collect the garbage every day except Sundays from all hotels, hospitals, fish stores, stands, restaurants, fruit and grocery stores and eating houses; and once each week from all residences of the city during the months of November, December, January, February, March, April and until May 15 and twice each week from May 15 during the months of June, July, August, September and October." The contract also reserves the right to the city to require the collection of the garbage from residences as often as twice each week during the months of April, May and other summer months, if the sanitary conditions require it; the city to pay extra compensation for this extra service. The city agrees in the contract to pay the disposal company $25,000 per year for collecting the garbage, so long as the terms of the contract are complied with. The only clause of the contract which met with objection by some members of the council was a clause which states that the disposal company will not be required to collect garbage on unimproved street or streets made impassable by city improvement construction, and gave the city health officer the power to determine when a street is impassable.

Waste Paper Collection in Scotch City.

Edinburgh, Scotland.—In the year ended May 15, 1917, the revenue of Edinburgh's cleansing department from waste paper collected and sold was £2,214 ($10,775), and the receipts from this source are largely increasing. During the two months to July 15, 1917, the quantity of paper sold was 129½ tons, giving a return of £1,206 ($5,870). There is no debit side to the account, as the revenue is derived from the essential municipal operations of cleaning and sanitation. The inspector of lighting and cleansing has made the following statement concerning the organization in his department for the collection and disposal of waste paper: "Previous to the spring of 1914 this department's interest in the collection of paper was confined to providing a local philanthropic agency with the free use of two vans with horses and drivers. About this time there was considerable trouble owing to loose papers being blown by the wind in the vicinity of the dumps in the country where the city's refuse is deposited, and in order to mitigate this nuisance steps were at once taken to recover as much as possible of this paper at the railway sidings where the refuse was loaded. These measures were followed by arrangements for withdrawing the two vans and establishing a direct collection of waste paper managed by the department. This came into operation in May, 1914. The general idea was to reach the citizens who put out papers with their refuse, to provide bags free of charge, and to visit every street on fixed days. A place was selected as headquarters and, a stock of bags having been procured, supplies were issued to the scavenging overseers, who report the addresses of citizens who agree to keep a bag on their premises. The carts removing the morning refuse are each provided with a bag in which books and papers (which are readily recoverable from the refuse) can be deposited, and this material is quite salable when the dust has been shaken out. The bags found most suitable for supplying to the public were hessian, and secondhand sugar and rice bags were readily obtainable before the war at 4d. and 4½d. (8 and 9 cents) each. A fair proportion of bags has also been salved from the refuse. Up to November, 1915, the paper was sold under contract in the condition collected, but from that date the department has undertaken the sorting as well. This is performed by female labor, 12 women on an average being employed, while two men with two hand-operated machines press the material into bales after it has been sorted. Instead of the two collecting vans employed in May, 1914, there are now six engaged in this work, and the number of bags lent out has increased to over 8,000. Each van is worked by the driver and two girls. The runs are made up on a loose-leaf system, and a record is available at all times of the addresses where our bags are in use and the number at each address. The bags taken out and brought in are tallied each day and losses are found to be practically negligible."

NEWS OF THE SOCIETIES

Calendar of Meetings.

Sept. 24-28.—CALIFORNIA CONFERENCE ON CITY PLANNING. Annual conference, Santa Rosa, Cal. Secretary, Charles H. Cheney, Crocker Building, San Francisco, Cal.

Sept. 24-29.—LEAGUE OF CALIFORNIA MUNICIPALITIES. Annual convention, Santa Rosa, Cal. Secretary, Wm. J. Locke, Pacific Building, San Francisco, Cal.

Sept. 24-29.—THIRD NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES. Exposition, Grand Central Palace, New York City.

Sept. 25-27.—SMOKE PREVENTION ASSOCIATION. Annual convention, Columbus, O. Secretary, Frank A. Chambers, City Hall, Chicago, Ill.

Sept. 25-27.—LEAGUE OF WISCONSIN MUNICIPALITIES. Annual convention, Racine, Wis. Secretary, Ford H. MacGregor, Madison, Wis.

Sept. 27, 28.—CANADIAN PUBLIC HEALTH ASSOCIATION. Annual congress, Ottawa, Ont. Secretary, J. G. Fitzgerald, M. B., Toronto, Ont.

Sept. 27-29.—AMERICAN AND CANADIAN ENGINEERS AND ARCHITECTS OF NORWEGIAN BIRTH OR DESCENT. Informal congress and re-union, Chicago Norske Klub, Chicago, Ill. Chairman, Committee on Arrangements, Joachim G. Giaver, consulting engineer, Chicago, Ill.

Oct. 10.—UNION OF BRITISH COLUMBIA MUNICIPALITIES. Annual convention, Duncan, B. C. Secretary, Ex-Reeve H. Bose, Survey Center, B. C.

Oct. 15-17.—NATIONAL HOUSING ASSOCIATION. Annual conference, Hotel La Salle, Chicago, Ill. Secretary, Lawrence Veiller, 105 East 22d St., New York City.

Oct. 15-17.—NATIONAL ASSOCIATION FOR STUDY AND PREVENTION OF INFANT MORTALITY. Annual meeting, Richmond, Va. Secretary, Gertrude B. Knipp, 1211 Cathedral street, Baltimore, Md.

Oct. 16-19.—LEAGUE OF KANSAS MUNICIPALITIES. Annual convention, Wichita, Kan. Secretary, Homer Talbot, University of Kansas, Lawrence, Kan.

Oct. 17-18.—LEAGUE OF MINNESOTA MUNICIPALITIES. Fifth annual convention, St. Cloud, Minn. Secretary-treasurer, Richard R. Price, University of Minnesota, Minneapolis.

Oct. 17-19.—AMERICAN PUBLIC HEALTH ASSOCIATION. Annual meeting, Washington, D. C. Acting Secretary, A. W. Hedrick, 126 Massachusetts Avenue, Boston, Mass.

Oct. 22-24.—AMERICAN CIVIC ASSOCIATION. Annual meeting, St. Louis, Mo. Secretary, Richard B. Watrous, 914 Union Trust building Washington, D. C.

Oct. 28-30.—TEXAS CONFERENCE ON SOCIAL WELFARE. Annual convention, Houston, Texas

Nov. 19-24.—CITY MANAGERS' ASSOCIATION. Annual meeting, Detroit, Mich. Secretary, W. L. Miller, City Manager, St. Augustine, Fla.

Nov. 20-21.—ASSOCIATION OF GOVERNMENTAL RESEARCH AGENCIES. Third annnal meeting, Detroit, Mich. Secretary, C. O. Dustin, Statistical Bureau, Red Cross War Council, Washington, D. C.

Nov. 20-23.—PLAYGROUND AND RECREATION ASSOCIATION OF AMERICA. Recreation Congress. Secretary, H. S. Braucher, 1 Madison Ave., New York, N. Y.

Nov. 21-24.—NATIONAL MUNICIPAL LEAGUE. Twenty-third annual meeting, Hotel Statler, Detroit, Mich. Secretary, Clinton Rogers Woodruff, 703 North American Bldg., Philadelphia, Pa.

Jan. 15-17.—VIRGINIA GOOD ROADS ASSOCIATION. Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

Feb. 6-13.—FIRST CHICAGO CEMENT MACHINERY AND BUILDING SHOW. Supersedes annual Chicago Cement Show. Held at the Coliseum, under direction of the National Exhibition Co.

March 17-24.—PAN-AMERICAN CONGRESS ON CHILD WELFARE, Montevideo, Uruguay. Secretary, Edward N. Clopper, 105 East 22d Street, New York, N. Y.

American Association of Engineers

The board of directors of the American Association of Engineers, at their meeting on September 5, granted charters to the members in St. Paul, Indianapolis and Milwaukee. This makes a total of seven chapters which have been organized since the association was incorporated about two years ago. The total enrollment of the national organization is over twenty-two hundred members.

A joint meeting of the association and the Detroit Engineering Society was held in the Commerce Building, Thursday, August 30. It was the unanimous opinion of the engineers present that the Detroit society should form a working co-operation with the American association, as they have been carrying out a similar program locally for Detroit as the other organization has operated in a national way. The Detroit society has a total enrollment of about 700 members, and if this working co-operation is established it will mean the furthering of the work laid out by the Committee on Engineering Co-operation.

Membership in the American Association of Engineers is being extended to all technical engineers in military service without payment of initiation fee or dues. This is part of the co-operative plan to keep them advised as to progress in the engineering field and to give them personal assistance upon their return to their professional work.

American Academy of Political and Social Science.

The country-wide expectancy in meeting the biggest problem of the war, conservation of agricultural and live stock resources, was described by national experts at the world's food conference of the American Academy of Political and Social Science, which convened in the assembly room of the Philadelphia Chamber of Commerce September 15.

"If we are to have more milk the consumer must learn to pay for it," W. H. Jordan, director of the New York State Agricultural Experimental Station, who presided at the afternoon conference, said, explaining: "This is the only solution to the milk problem. In some parts of the country milk cannot be produced at the present prices. Milk is the most eco-economical food that can be used in the family, and because of its highly nutritious qualities the consumer can well afford to pay more for it. Milk is not a luxury, as it has been regarded, but the best animal food."

Charles Lathrop Pack, president of the National Emergency Food Garden Commission, through whose activities since last February hundreds of thousands of "war farms" have been established in every city, town and hamlet of the country, said that through this form of intensive cultivation the nation's food supply has been increased to the extent of more than $350,000,000. Next year we will do even better. He continued: "We will then have more war gardens and the average product of each will be larger. There is much evidence that our food gardens are helping our people to feed themselves more reasonably.

"The results will mean much for food this winter f. o. b. the pantry shelves of the homes of America and help us by feeding ourselves to feed our boys of the army and navy and our Allies. The canning and drying movement has brought back to thousands of American households an art almost forgotten since our grandmothers' day."

The Mayor's Food Commission and the Chamber of Commerce were assailed by Mrs. N. D. Hitchcock, instructor in marketing, Temple University. She said: "If these experts with all their information and training would put their minds on this food question and get to work the housewives would be relieved of their greatest difficulties in obtaining food. They should get busy and provide better facilities for the transportation of food into the city and to and from the various markets. It is the duty of the city, as well as the state and nation, to put the food where the women can get it. It has passed the women to bring it to the city or markets.

"Our markets do not compare favorably with those of European cities. Our food terminals are inadequate. Too much time is lost in hauling the food from the stations to the markets and back again, thus increasing its cost. Food cannot be hauled without shrinkage and damage. Wholesalers, retailers and all others handling food must conserve it. Food speculation should be treated as a crime the same as treason, and I want every woman here to join me in urging that this be adopted.

"We are putting too much of a tax on the women, and they have not the training for handling this problem. The schools have done good work, but have failed to give adequate training in practical and simple home economics. Every girl of fourteen years should be able to select food and cook it, and cook it well. It is not that our girls cannot do this but because we have not taught them to do it. Co-operation is what we need in every phase of the problem, and that is what we are coming to."

National Safety Council.

The Sixth Annual Safety Congress was recently held at the Hotel Astor, New York City, on September 11 to 14. At the same time a big exposition of safety and sanitation was shown at the Grand Central Palace, which drew large crowds.

The work of the council was divided into general round-table discussions, general sessions and sectional meetings. In the sections of the council the following divisions were included:

"Industrial," "Transportation and Public Service," "Health and Industrial Relations," "Public Administration" and "Public Safety." Among the committees which presented important reports were those on safe practices, industrial preparedness, statistics of industrial accidents and hygiene, danger emblem and fire prevention.

At the general session held Wednesday morning, at which President L. R. Palmer of the Council was chairman, the following addresses were made: "Economic and Social Value of Accident Prevention," by Dr. Charles P. Steinmetz; and "Progress and Possibilities of Accident Prevention Work," by M. A. Dow, of the New York Central lines. The opening address was made by Hon. William B. Wilson, Secretary of Labor, Washington.

The chemical section meeting, of which the chairman is J. R. de la Torre Bueno, of the General Chemical Company, discussed many phases of the safe handling of various chemicals.

The health service section meetings received reports from a number of committees, including those on standard forms, health insurance, medical work and interpretation and evaluation. Miss Ida M. Tarbell gave an address on "Health for Every Man." Other papers presented before the meetings of this section included "Health Instructions," Dr. C. E. Ford; "Conservation of the Health and Safety of the Worker During War," Dr. Harry E. Mock; "Sanitary Standards in Industry," Dr. T. A. Cousins; "Occupational Diseases and Their Elimination from the Industries," Dr. Alice Hamilton, of the U. S. Bureau of Labor; and "Employment, Examination and Medical Supervision," Dr. T. E. Mead. "The Need for Visiting Nurses in Industry" was presented by Miss Ella P. Crandall, of the National Organization for Public Health Nursing.

At a dinner held Wednesday night, the speakers were Hon. William C. Redfield, Department of Commerce, Washington; George F. Vincent; Job Hedges; and John Mitchell.

On Thursday morning a general session was held, at which, among others, papers on "Duties of the Safety Engineer," by David Van Schaak; "How to Organize for Safety," by C. W. Price; and "Educational Activities in the Safety Field," by Earl B. Norton, were presented.

At two meetings of the electric railway section the following were presented: "Prevention of Accidents Between Street Cars and Automobiles," by T. I. Hardy, general manager Chicago, South Bend & Northern Indiana R. R. Co.; and "Co-operation Between the Claim Department and the Transportation Department."

The public utilities section heard the following papers: "Safety Practices in Telephone Work," by John F. Naylon; "Safety Work in Gas Companies," by Edward L. Davies, Queensborough Gas & Electric Co., New York; "Safety Work as It Applies to Electric Generating and Substations," by H. J. Burton, Consumers' Power Co., Jackson, Miss.; and "Accident Prevention in the Electrical Field," W. C. Pearce, Syracuse (N. Y.) Lighting Co.

On Friday morning at a round-table

(*Continued on page 322.*)

PERSONALS

Coghlan, B. K., has resigned as associate professor of highway engineering at the Agricultural and Mechanical College of Texas. He is captain in the Engineer Officers' Reserve Corps and has been ordered to Ft. Leavenworth.

Gear, J. T., recently city engineer of Kelso, Wash., has been appointed city engineer of Puyallup, Wash. This office has been vacant since April, when City Engineer Ball resigned. Before taking up engineering Mr. Gear was a banker.

Hazlehurst, James Nisbet, has resigned as chairman of the board of consulting engineers of the city of Atlanta and from the chairmanship of the executive committee of the affiliated technical societies of the city of Atlanta and the state of Georgia to take up military duties. Mr. Hazlehurst will leave at once for service with the expeditionary forces in France.

Medley, William H., chief of police of Fall River, Mass., died September 16 from injuries received in an automobile accident.

Palmer, W. K., who for sixteen years past has been continouusly engaged in consulting engineering practice, and the head of the firm of The W. K. Palmer Company, engineers, Kansas City, Mo., has accepted a commission as major in the Engineer Corps of the U. S. Army. In consequence, his practice and the business of The W. K. Palmer Company has been discontinued for the period of the war. Mail can be addressed to the old number, however, and forwarded in due course, but no new business will be undertaken or accepted. Major Palmer organized engineer troops at the beginning of the war and has been actively engaged in military matters for some time past.

Wiley, John, has resigned as captain of the Salem (Mass.) fire department to go in business.

Young, Robert K., state public service commissioner of Pennsylvania and former state treasurer, died at Wellsboro, September 12, from an accident sustained in June of this year.

PROBLEMS CITIES ARE STUDYING WITH EXPERTS

STREET IMPROVEMENTS are to be made by Frankfort Heights, Ill. The engineer for the work is P. B. Wilson, Marion, Ill.

Normal, Ill., is making SEWER IMPROVEMENTS. The designing engineers are Melluish & Broyhill, Unity building, Bloomington, Ill.

A WATER STORAGE BASIN is to be built by Atlantic, Ia. Plans are in preparation by J. H. Mayne, 235 Merriam building, Council Bluffs, Ia.

SEWERAGE IMPROVEMENTS are to be made by Holdrege, Neb. The engineers are Grant & Fulton, 505 Bankers Life building, Lincoln Neb.

A number of improvements are to be made at the WATERWORKS of St. Paul, Minn. The consulting engineer for the work is J. F. Druar, 314 Commercial Building, St. Paul, Minn.

A CITY PLAN and ROADS and other improvements are proposed for Rockford, Ill. The architects and engineers for the work are the American Park Builders, 140 S. Dearborn street, Chicago, Ill.

Extensive improvements are proposed on the WATER SUPPLY SYSTEM of Springfield, Ohio. City Manager Ashburner has called into consultation to report on the situation Allen Hazen, of Hazen, Whipple & Fuller, 30 East 42d street, New York, N. Y.

A $60,000 bond issue has been voted for the improvement of the HIGHWAYS of Crosby County, Tex. The work was designed and planned by the consulting engineer, Henry Exall Elrod, Interurban Building, Dallas, Tex.

Cleveland, Ohio, is to build a $2,500,000 AUDITORIUM and CONVENTION HALL. The consulting architects for this project are Walker & Weeks, 1900 Euclid Building, Cleveland.

A new BRIDGE is to be built by Camden County, St. Mary's, Ga. The consulting engineer for the proposed structure is William M. Torrance, 129 Bull street, Savannah, Ga.

Harrisburg, Pa., is planning to increase its WATER SUPPLY. A report on the necessary improvements has been submitted by the consulting engineer, F. H. Shaw, Breneman Building, Lancaster, Pa.

Bids are soon to be received by the city of Carbondale, Pa., for the construction of SEWERS and DISPOSAL WORKS, the latter to cost $60,000. The consulting engineer for the proposed improvements was Clyde Potts, 30 Church street, New York, N. Y.

SEWERS and a SEWAGE DISPOSAL PLANT are to be built by Ada, Okla. The preparation of plans and specifications for the projected improvements has been in the hands of the consulting engineers, The Benham Engineering Co., Colcord Building, Oklahoma City, Okla.

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

WALKER ELECTRIC VEHICLES.

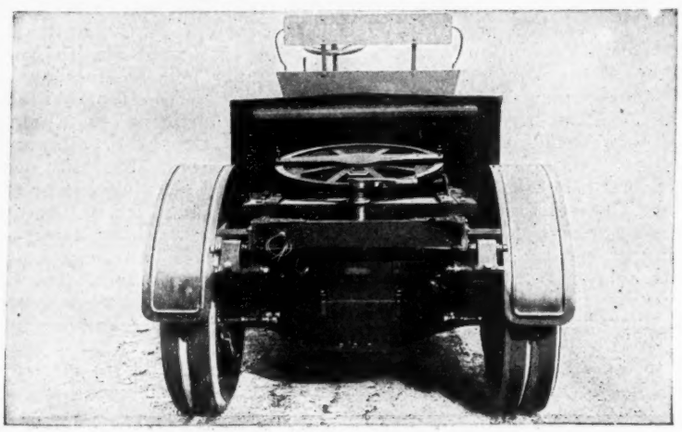
With Special Balance Drive Feature.

The outstanding feature of the Walker electric vehicle is the balance drive. To this is attributed the high and permanent efficiency of operation, due to the simple design, permanent alignment and balance of the working parts. The drive is all housed in the hollow rear axle and hollow rear wheels and consists of only the following ten parts, all rotating. The electric motor is located in the hollow torpedo-shaped rear axle. The differential is direct connected to one end of the hollow armature shaft. The two draft shafts extend from the differential sockets into the center of each hollow rear wheel, with a pinion on the wheel end of each shaft. Two idler gears are in each wheel, mounted on the stub-axle yoke arms. The rim gears are fastened to the inside of the tire rims. The motor and direct-connected differential drive the shafts, the pinions of which drive the wheels by means of the idler and rim gears.

The single motor is of the series type, of ample capacity and fully inclosed. The armature shaft is of large diameter and hollow, and mounted on extra large ball bearings. The motor is designed for maximum efficiency under variable load conditions. It is easily accessible. Sixty-volt motors are furnished for operation with Edison batteries, and eighty-volt motors for lead batteries. The differential is self-contained, direct-connected bevel gear type, with case bolted to flange integral with the hollow armature shaft.

Speed control is through improved continuous torque drum type controller, giving five speeds ahead and five reverse, located under the seat and instantly accessible. The control handle is operated conveniently by driver's left hand. Steering is by means of an improved wheel steering mechanism located on left-hand side. There are two sets of brakes, large contracting and also expanding types, both on rear wheels.

The front axle is high-grade steel drop forging I-beam section with drop forged steering knuckles and arms. The steering knuckles are mounted on Timken roller bearings. The rear axle, containing the drive, is a hollow steel torpedo-shaped tubular section. The front wheels are steel disc wheels mounted on Timken roller bearings, specially designed for attractive appearance and strength. The rear wheels are also steel discs, with radial corrugations in the form of spokes inclosing the drive gears. They are dirt and water proof. They are partly filled with lubricant, which is distributed continuously over all working parts. These wheels are mounted on roller bearings and supported by stub axles secured into the ends of the hollow rear axle.



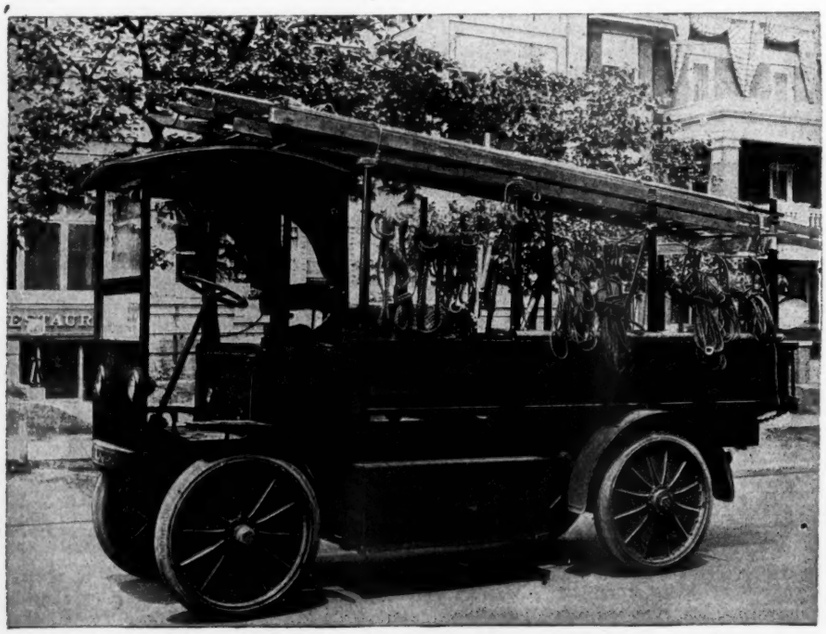
WALKER ELECTRIC TRACTOR (SHOWING FIFTH WHEEL)

The chassis frame is of improved design, all steel, channel section. The frame is provided with truss rods and has a steel bumper in front. The springs are semi-elliptic front and rear; heat treated chrome-vanadium steel. The wheel gauge is 56 and 62 inches. The wheel base varies to suit length of body back of seat required by loading space needs.

The batteries are furnished of a type best suited for the particular service. The mileage capacity per charge of battery is calculated to be ample for service requirements. The maximum speed is 15 to 10 miles per hour.

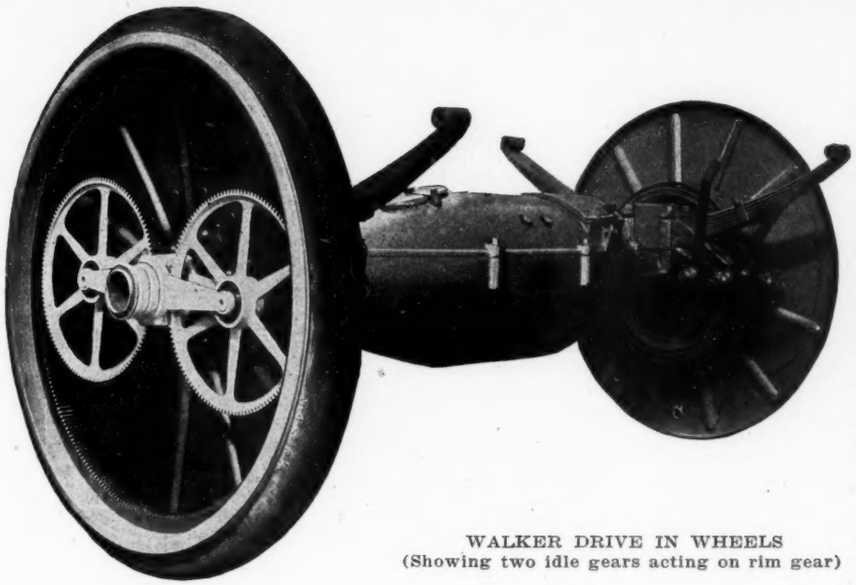
The vehicle described is made in six capacities—1,000, 2,000, 4,000, 6,000, 8,000 and 10,000 pounds. Tractors are also built to suit service conditions, with capacities up to 15 tons gross trailing load. Bodies are made in any type for all kinds of service, such as for municipalities, public utility corporations and contractors. One interesting example is a 5-ton chassis with a standard 6-yard side-dump Lee body.

The accompanying illustrations show two views of the drive mechanism, a rear view of the five-wheel type tractor and a model L 2-ton Walker,



2-TON WALKER ELECTRIC OPERATED BY CITY OF CHICAGO

equipped with special compartment body for overhead line construction, owned and operated by the department of gas and electricity of Chicago.



WALKER DRIVE IN WHEELS
(Showing two idle gears acting on rim gear)

This vehicle is made by the Walker Electric Vehicle Company, 531-545 West 39th Street, Chicago, Ill.

CHIPPING HAMMER AND AIR DRILL.

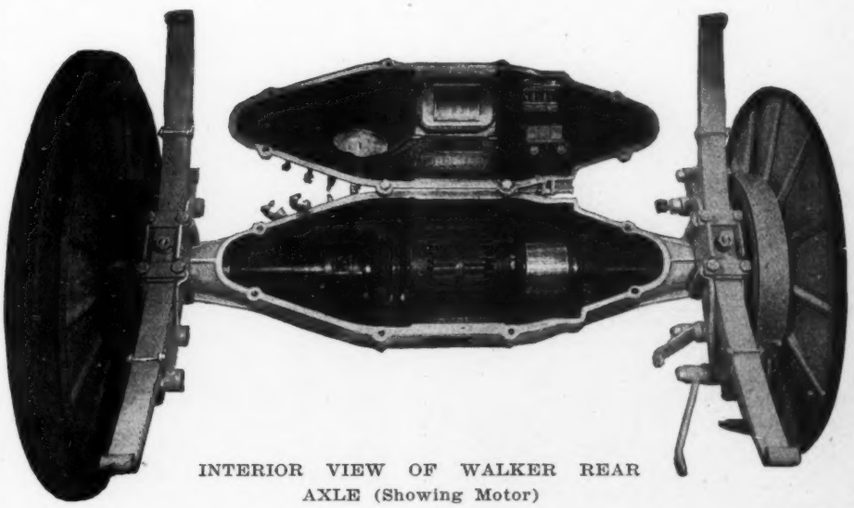
Compressed Air Tools Found Economical by Contractors.

As recently described in Municipal Journal, the department of public works of Baltimore, Md., has found the use of a chipping hammer, operated by compressed air, very economical for toothing out granite block and vitrified brick pavements when making repairs to cuts. Two size B, No. 2 Thor chipping hammers were used, and the average day's work was 300 lineal feet of toothing, at $6.79 per day, or 2.26 cents per foot. Previous to the purchase of these hammers stone masons were employed by the city who did about 26 lineal feet of toothing in an average day's work, at $4.50 per day, or about 18 cents a foot. This type of hammer is also used to cut down the edges in brick paving work.

The new Thor single-valve chipping hammer is equipped with a new type of valve mechanism. The valve block consists of two solid cylindrical parts hardened and ground to fit. The valve is a cylindrical shell (hardened and ground) placed on the outside of the valve block, with the wearing surface covering practically the entire block. The handle affords complete protection to the valve. The wearing surface of the valve is claimed to be many times larger in proportion to its weight than in any other hammer. This construction allows for extra large inlet and exhaust ports, and the large area for shifting the valve moves it with extreme precision with relation to the travel of the piston. This hammer is made in sizes from 1 to 5 inch stroke, with piston diameter of 1-1/16 inches. The size B hammer has a 2-inch stroke, works on 13 cubic feet of free air per minute and gives 2,200 blows per minute. It weighs 9 pounds and has an overall length of 13 inches. The cut on the next page shows a size B hammer with retainer.

Roller bearing piston air drills, a cross-section of which is shown in the other illustration, are claimed to have an actual increase in power over the plain bearing type of at least 25 per cent. In addition, the Corliss valves, telescopic screw-feed and removable crank chamber plate insure operating economy. These features allow also for a longer range in drilling and give easy access to the inside working parts.

These are two examples of a comprehensive line of compressed air tools made by the Independent Pneumatic Tool Company, Thor Building, Chicago, Ill.



INTERIOR VIEW OF WALKER REAR AXLE (Showing Motor)

INDUSTRIAL NEWS

Cast-Iron Pipe.—It is expected that the recent price regulation of iron ore, pig and finished products will have an effect of lowering prices very soon. Quotations: Chicago, 4-inch Class B and heavier, $68.50; 6-inch, $65.50. New York, 4-inch, Class B and heavier, $68.50; 6-inch, $65.50. Birmingham, 4-inch, Class B and heavier, $63; 6-inch, $60; Class A, $1 extra.

The Duplex Truck Company, Lansing, Mich., through its secretary and treasurer, George W. Hewitt, has given out the following statement: "With our new factory buildings completed in November and machinery installed by the first of the year, our production of heavy haulage trucks will be increased to about 300 monthly during 1918. The value of Duplex trucks to be manufactured during 1918 will total $12,960,000, or about ten times the value of our 1917 production. Our new factory buildings will give us about 100,000 square feet of additional floor space—one of the buildings being 402 by 72 feet, and the other 306 by 72 feet. Both are two-story structures."

The Asbestos Protected Metal Company, Pittsburgh, Pa., is very proud of the patriotism displayed by its personnel. Up to date the honor roll of the company includes: Stuart S. Caves, formerly in engineering dept., Officers' Reserve at Ft. Niagara. F. C. Easterby, formerly district representative at St. Louis, constructive quartermaster Ft. Riley, Kas. W. C. Fanning, formerly in engineering dept., Officers' Reserve, Ft. Niagara. Wm. H. Hale, formerly district representative at Minneapolis, Minn., has completed training, Officers' Reserve. E. G. Irwin, formerly district representative at Cincinnati, O., now somewhere in the south with Ohio National Guard regiment. J. R. Nichols, formerly district representative at Atlanta, Ga., now Captain of Field Artillery. Walter A. Slingluff, formerly in skylight dept., enlisted with Pittsburgh regiment of engineers and now somewhere in France. John

B. Williamson, formerly in erection department. Commissioned First Lieutenant of Engineers and now in Washington. P. J. Young, formerly chief engineer, commissioned First Lieutenant of Engineers and now somewhere in France. T. R. Galey, formerly district representative at Dallas, Tex., Officers' Reserve, Leon Springs, Texas.

Catalogs for Foreign Commerce.

The Bureau of Foreign and Domestic Commerce desires to obtain a collection of trade catalogs published in the United States and in foreign countries. So far as possible bound catalogs are desired, or at least the more substantial unbound catalogs. Casual catalogs, folders, circulars and the like are not wanted. It is especially requested that catalogs issued in foreign languages by American concerns be supplied. When new editions are issued the latest copy should be sent to the bureau, so that the collection may be kept up to date from year to year. It is requested that the catalogs be advanced to "Bureau of Foreign and Domestic Commerce, Research Section, Washington, D. C." The following list enumerates some of the classes of catalogs that will be included in the collection: Automobiles, truck, motorcycles, and parts and accessories; chemicals; construction materials, including cement, iron and steel, lumber, etc.; implements and tools; India rubber, gutta-percha, and substitutes for and manufactures therefrom; machinery, including all lines, such as agricultural, dredging, engines (gas, gasoline, steam, etc., of all kinds), general mining, pumps, etc.; oils; paints and varnishes; scientific instruments; vehicles, including automobiles, carriages, cars, etc.

NEWS OF THE SOCIETIES

(*Continued from page* 319.)

discussion, under the chairmanship of R. W. Campbell, was held on the topic: "Practical Methods for Organizing Public Safety in Cities."

The exhibition at the Grand Central Palace was an interesting feature of the conference. Moving pictures to bring home the lessons of safety were attended by crowds. The exhibits included safety devices of all kinds, the work of the New York City fire department and the National Red Cross, insurance companies and large public service corporations. One of the most instructive and carefully prepared exhibits was that of the Prudential Life Insurance Company, Newark, N. J.

American Public Health Association.

"War and Health" will be the central theme at the meeting of the American Public Health Association at Washington, D. C., October 17-20. Some of the speakers on these subjects will be Surgeon General Gorgas, U. S. A.; Surgeon General Braisted, U. S. N.; Colonel T. H. Goodwin, of the English Army; Assistant Surgeon General J. W. Trask, U. S. P. H. S., and representatives of the French and Canadian sanitary bureaus.

Each of the seven sections of the association will have a conference on health problems and opportunities of the war, and a symposium on this subject will be given at one of the general sessions by committees from each section.

Mayors, boards of health, and others interested in sanitary science all over the country are invited to be present or to send representatives to the war meeting. The association emphasizes the necessity of obtaining hotel accommodations well in advance, as Washington will be crowded. Non-members are welcome.

The complete program has not yet been published but will appear in the October number of the American Journal of Public Health, to be published shortly before October 5. Separate programs may be had by addressing the acting secretary at 126 Massachusetts avenue, Boston, Mass.

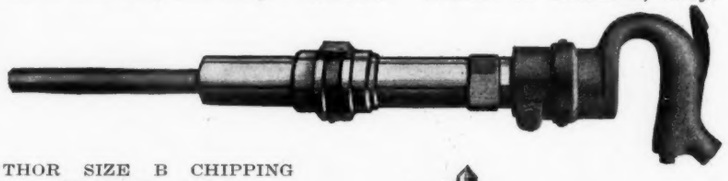
Although a large part of the meeting will be devoted to health problems of the war, about half of the papers will be of a non-military nature.

Following is a partial list of the papers to be presented:

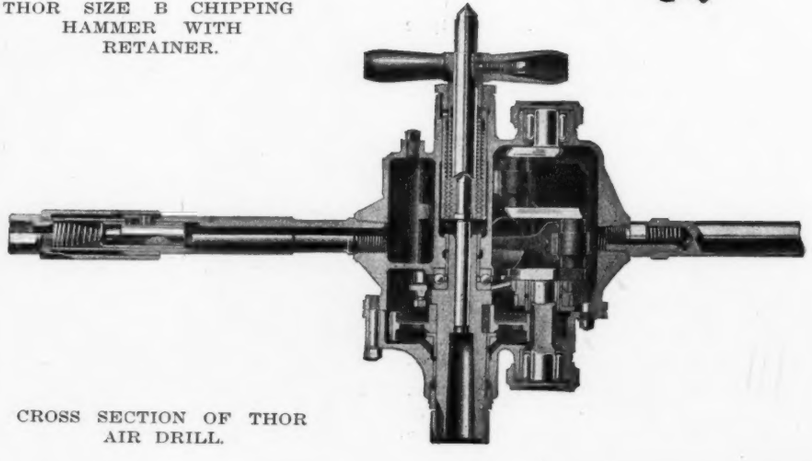
Presidential address by W. A. Evans, M. D.; and addresses by Surgeon-general W. C. Gorgas, U. S. A.; Surgeon-general W. C. Braisted, U. S. N.; Assistant Surgeon-general J. W. Trask, U. S. P. H. S.; Col. T. H. Goodwin, of the English Army; Franklin H. Martin, M. D., National Council of Defense; Herbert C. Hoover (or a representative), director U. S. Food Administration. "War and Mental Diseases," Major Pearce Bailey, U. S. A. "Tuberculosis and the War," Dr. Herman M. Biggs, State Health Commissioner, Albany, N. Y. "Report of Committee on Venereal Diseases," Dr. W. F. Snow, member Advisory Council of Defense. Symposium, "Venereal Disease Control in the Army and Navy." "Rehabilitation of Injured and Crippled Due to the War," Major Joel E. Goldthwaite, M. R. C. Chairman's address, "Some Public Health Problems of the Present War," Dr. E. C. Levy, chairman Public Health Administration Section. Chairman's address, "The Service of Health Laboratories in Time of War," Dr. Henry Albert, chairman Laboratory Section. "Sanitation of Barracks and Surrounding Zones," speaker to be announced. "Role of the Local Health Officer in National Defense," speaker to be announced. "Notification of Diseases and Protection of Troops," A. J. Chesley, M. D., Minneapolis, Minn. "General Measures for the Prevention and Control of Industrial Diseases in Time of War," Dr. Alfred Stengel. "Need for Sanitary Supervision of Industries in Time of War," Dr. E. R. Hayhurst, Columbus, Ohio. "Practical Points in the Safe Handling of T N T and Allied Explosives," Dr. G. W. Hudson. "Replacement of Men by Women in War Industries," Josephine Goldmark or Ida Tarbell. "Industrial Fatigue—Its Relation to War Industries," Prof. Frederic S. Lee. "War Activities of the Bacteriological Laboratories in France and England," Dr. William H. Park, Director of Research Laboratories, New York City. "Canadian Laboratories in War Service," Dr. Nasmith, Director of Laboratories, Toronto, Ontario.

New York Patrolmen's Protective Association

At the annual convention held at Rensselaer, N. Y., Sept. 5 and 6, the association re-elected Thomas P. Dolan of Albany to the presidency of the order. The other officers elected are: First vice president, William A. Barney, Rensselaer; second vice president, James V. Connelly, Kingston; third vice president, Frederick Greenough, Schenectady; secretary, Edward P. McMahon, Syracuse; treasurer, Richard J. O'Brien, Albany; auditor, William H. Redmond, Troy.



THOR SIZE B CHIPPING HAMMER WITH RETAINER.



CROSS SECTION OF THOR AIR DRILL.